APPENDIX D – RAVALLI COUNTY

SUMMARY OF PROJECT SCOPE

The panelization scheme reveals an estimated 39 printed and 68 non-printed (107 total) panels in the DFIRM as a result of the digital conversion, with a rough cost of about **$180,000**. Studies or restudies could impact the number of panels for the DFIRM. There are no LOMRs to be incorporated.

There are two XDSs to be incorporated as part of the digital conversion that require FEMA approval. The flooding sources for which flood hazard data is available through these two XDSs are:

- East Fork Bitterroot River – about 25 miles from the confluence with the main stem to the Springer Memorial as studied by the NRCS,
- West Fork Bitterroot River – about 21 miles from the confluence with the main stem to the Painted Rocks Dam as studied by the NRCS, and
- Nez Perce Creek –from just below the confluence with the Little West to the West Fork Bitterroot River, about 3.4 miles, as studied by the USACE.

Two other XDS for Burnt Fork and Skalkaho Creek are being reviewed by the DNRC and considered for incorporation.

The County identified many areas for restudy; the top priorities are:

- About 715 miles of about 80 flooding sources covering almost the entire FIRM of delineated Zone D areas that are requested to be relabeled (or restudied if necessary) as Zone A areas,
- Detail study on Eightmile Creek from the confluence with Bitterroot River to the USFS Boundary, about 8 miles (currently shown as a delineated Zone D),
- Detail study on Three Mile Creek from the confluence with Bitterroot River to the USFS Boundary, about 14 miles (currently shown as a delineated Zone D),
- Detail study on Ambrose Creek from the confluence with Three Mile Creek to the USFS Boundary, about 9 miles (currently shown as a delineated Zone D),
- Detail study on Dry Gulch Creek from the confluence with the Bitterroot River to the USFS Boundary, about 8 miles (currently shown as a delineated Zone D), and
- Detail study on Willow Creek from the confluence with the Bitterroot River to the USFS Boundary, about 10 miles (currently shown as a delineated Zone D).

All XDSs and restudy needs are listed on the Data Collection Worksheet.

The project as listed above is estimated at about **$1,101,000.**

CONTACT INFORMATION

First	Last	Agency or Municipality	Title/Responsibility	E-mail Address	Phone Number	Street Address	City	St	Zip
Millie	Bowman	DNRC	Map Mod Coordinator	mbowman@mt.gov	406.444.6656	1424 9th Ave; PO Box 201601	Helena	MT	59620-1601
Larry	Schock	DNRC	Regional Manager	lschock@mt.gov	406.721.4284	101 S 3rd St West	Missoula	MT	59801
Rick	Scheele	Darby, Town of	Mayor	darbymontana@usa.net	406.821.3753	PO Box 37	Darby	MT	59829
Land	Hansen	Hamilton, City of	Building Inspector	bldginsp@cityofhamilton.net	406 363.3316	202 S Third St	Hamilton	MT	59840
Laura	Hendrix	Ravalli County	Floodplain Administrator	lhendrix@ravallicounty.mt.gov	406.375.6229	215 S. 4th St., Ste. F	Hamilton	MT	59840
Ken	Miller	Ravalli County	GIS Department	kmiller@ravillicounty.mt.gov	406.375.6622	215 S. 4th St., Ste. F	Hamilton	MT	59840
Greg	Chilcott	Ravalli County	Commissioner	gchilcott@ravalliicounty.mt.gov	406.375.6500	215 S. 4th St., Ste. F	Hamilton	MT	59840
James	McCubbin	Ravalli County	Attorney	jmccubbin@ravallicounty.mt.gov		215 S. 4th St., Ste. F	Hamilton	MT	59840
Karen	Hughes	Ravalli County	Interim Director, Planning	khughes@ravallicounty.mt.gov	406.375.6530	215 S. 4th St., Ste. F	Hamilton	MT	59840

SCOPING MEETING NOTIFICATION

From: Karen Price <highstarconsulting@mac.com>

Date: May 5, 2006 2:25:01 PM MDT

To: kmiller@ravallicounty.mt.gov, bldginsp@cityofhamilton.net, darbymontana@usa.net, Laura Hendrix <lhendrix@ravallicounty.mt.gov>

Cc: Dan March <DEMarch@pbsj.com>, Millicent Bowman <mbowman@mt.gov>, Terry Voeller <tvoeller@mt.gov>, Marijo Camrud <marjio.camrud@dhs.gov>, cbhiginbotham@pbsj.com

Subject: Ravalli County DFIRM

Good afternoon,

The Montana Department of Natural Resources and Conservation (DNRC), in coordination with the Federal Emergency Management Agency (FEMA), is interested in updating the Flood Insurance Rate Map (FIRM) for Ravalli County. Under FEMA's Map Modernization Program, the first step in this process is to meet with local Floodplain Administrators and GIS Specialists from National Flood Insurance Program (NFIP) communities. One of our goals at this Scoping Meeting is to provide information to community and county representatives about the Map Mod Program and the resulting GIS-based Digital FIRM (DFIRM).

In support of the DNRC and FEMA, PBS&J and High Star Consulting will be facilitating this scoping effort, including the upcoming meeting. We would most appreciate if you could attend. The meeting will be held in Hamilton on Tuesday, May 23rd, from 1:30 to 3:30 p.m. at the Ravalli County Administrative Center, 215 South 4th Street, in the Commissioner's Meeting Room on the 3rd floor.

In addition to providing you with information about the program, the DFIRM process, and the map products, we would like to gather some information from you. Specifically, we are interested in learning of local base map data that could be used for the DFIRM to help tailor the maps for local planning department's use. A document is attached for GIS professionals describing the type of base map data FEMA is interested in for the DFIRM. We would also like to learn of those flood hazard areas that may need study or restudy. A spreadsheet is attached for Floodplain Administrators showing the data we have so far of the "mapping needs" in your county. Feel free to edit the existing data or add new information before the meeting (don't worry if you can't fill in all the fields); if you know of existing studies that could be reflected on the new DFIRMs, please add that information as well. We will bring a large map to use for discussions about restudies - at the end of the meeting we will try to prioritize these restudy needs for use in determining the project scope.

I have been working in the NFIP for several years and managed DFIRM efforts in other States. I would love to talk with you before the meeting by phone to answer any questions you have, provide some background, or learn of restudies you are interested in. Give me a call anytime at 303.345.4728. Please RSVP about the meeting by responding to this email, including names of any other local representatives who may be interested in attending.

Thank you very much - I look forward to talking with you!

Karen Price

High Star Consulting, Inc.
highstarconsulting@mac.com
303.345.4728
3321 Brushwood Drive
Castle Rock, CO 80109

Attachments

Countywide DFIRM Base Map Data

This document is intended to serve as a guide to gathering, evaluating, and submitting datasets for inclusion in a countywide Digital Flood Insurance Rate Map (DFIRM), including an explanation of base mapping data needs, standards, and the delivery deadline.

Overview

In the beginning phases of a DFIRM project, data is gathered and compiled by the contractor into countywide GIS layers for use in FEMA DFIRM hard-copy map production. This data is also converted to the FEMA Standard DFIRM Database format that will be distributed to the communities with the hard-copy flood insurance maps and the Flood Insurance Study (FIS). The gathered and compiled data will form the base map for the project. FEMA has set forth GIS and mapping standards adopted from the National Standards for Spatial Data Accuracy (NSSDA) and published in FEMA's document: *Guidelines and Specifications for Flood Hazard Mapping Partners, Appendix A* (http://www.fema.gov/pdf/fhm/frm_gsaa.pdf). FEMA feels that the best data is local data and ultimately prefers to use community datasets that meet or exceed their specifications rather than using National-level datasets.

Certification

For FEMA to use the data, certification and permission must be provided with the data. The certification is a written statement from the contributing organization that the data meets FEMA's minimum standards and specifications. The permission is a written statement that FEMA may use the data for their digital base map, and that FEMA may use and distribute hardcopy and digital products using the digital base map with no monetary charge.

Submittal Deadline

A FEMA-approved base map is one of the first steps in developing a DFIRM for each county. The base map must be submitted to FEMA early in the process; therefore, it is essential that contractors receive all locally-developed data that the communities would like to see in their maps by the deadline (no deadline has been set for this project at this time).

DATA STANDARDS

This section outlines the mapping data standards set forth by FEMA for data to be included in any DFIRM project. All data submitted for this project must conform to these standards to be included in the final DFIRM hard-copy and Database products. These specifications are published in the *Guidelines and Specification for Flood Hazard Mapping Partners* and are available from FEMA's web site.

File Format

FEMA specifies many acceptable formats, and a full listing can be found in *Appendix L* of the *Guidelines and Specifications for Flood Hazard Mapping Partners*. The vector mapping files will be submitted to FEMA in an ESRI format and production work will take place in either an ESRI coverage format or an ESRI geodatabase format for vector datasets. Data to be included in the County DFIRM should be submitted in these formats or shapefile if possible. A Microstation CAD format is also acceptable as an alternative if the data is not available in a GIS format.

Imagery may be submitted in many formats including: .jpg, .tif, .sid, or .ecw. Topographic information can be accepted in grid, DEM, TIN, or TVC formats. If you have data to be submitted in a format other than those listed, please contact us and we can work with you toward a solution. Please include the coordinate system, datum, and projection information with the imagery as well as referenced world files if applicable.

Quality
Topological fidelity must be maintained on all vector layers submitted for inclusion in the County DFIRM. If shapefiles or CAD files for both polyline and polygon are submitted for a single layer (i.e. Floodplain delineation polygons and line work are submitted in two separate files), those boundaries must be mathematically coincident. Overshoots, undershoots, dangles, psuedonodes, and slivers must be eliminated from the submitted datasets prior to submission.

Scale and Accuracy
FEMA relies on National Map Accuracy Standards for dataset accuracy. These standards are located in *Guidelines and Specifications for Flood Hazard Mapping Partners, Appendix A* and *L*. These standards for base mapping layers (aerial photography, centerlines, etc.) are:

- ✶ scale of 1:20,000 or better;
- ✶ raster resolution of 1M or better;
- ✶ radial-RMSE (rRMSE) of 38 feet at the 95% confidence level.

Coordinate System and Projection
The final data layers for this project may be submitted to FEMA and published in UTM (meters), NAVD88, NAD83, feet. Check with the project GIS manager about submittals in State Plane Coordinate System. Data may generally be submitted for inclusion to the DFIRM in any coordinate system, projection, horizontal or vertical datum so long as it is common, recognizable, documented, and easily converted to the project system.

Distribution
FEMA must be able to distribute an unlimited number of hardcopy maps produced from these data, and they must be able to freely distribute the datasets used to create the maps. The data must also be available at zero cost to FEMA. Data distribution and use agreements can be signed by FEMA to limit data distribution in some cases and are dealt with on a case-by-case basis. FEMA also allows high quality data used in production of hard copy mapping products to be distributed in a reduced quality format. For example, 1-foot pixel aerial photography used to create DFIRM maps may be resampled to the 1-meter minimum resolution for distribution. Additionally, sensitive vector data, on special occasion, may be rasterized for distribution.

Currency
Data to be included in the countywide DFIRM must have been created or reviewed for currency within the past seven (7) years.

Coverage
FEMA requires complete county coverage in either a raster or vector format. The base map data for the county must ultimately cover the entirety of the County and Incorporated Communities in a **vector** dataset. Although a vector dataset will be used as the countywide base map, submission of ortho-rectified aerial imagery will assist the project by providing a source for georeferencing hard copy scans as well as assisting with feature verification. Data may come from multiple sources but all sources must meet the requirements stated above.

Metadata
All datasets delivered from the community to DNRC for use in the DFIRM project must be accompanied by descriptive metadata files. FGDC compliant metadata will be delivered to FEMA with preliminary and final maps and data. This format is also the preferred format for community submittal of data to DNRC for inclusion to the DFIRM. If the FGDC format does not exist for the datasets and/or is not attainable, an alternate format is acceptable. A data dictionary and detailed description of the datasets are required at a minimum.

Summary
If the above FEMA standards: scale of 1:20,000; resolution of 1 meter; currency of 7 years; freely distributable; accuracy of 38 feet rRMSE; complete coverage, and accompanying metadata can not be met or exceeded with existing community datasets for inclusion into the DFIRM and submittal to FEMA for the countywide DFIRM, then FEMA will necessitate the use of USGS quarter quadrangle aerial photography collected through the National Aerial Photography Program as the default base map for the project.

No data is being requested at this time – only a list of data that meets FEMA specifications and is likely to be available for use in the DFIRM project.

DATA LAYERS FOR USE IN BUILDING A DFIRM

FEMA and the DNRC are requesting that the following data layers from your area be submitted for inclusion into the DFIRM if they are available from your area. If your community has data meeting the above-described data standards and formats, and your community is willing to certify and allow this data for FEMA's use, please let us know which layers you can contribute, and send them in.

We are looking for:

- Transportation
  - Street and Highway Centerlines
  - Railroads
  - Airport Runways
  - Feature names. Should be included in a database or linked table
- Flooding Sources
  - Stream centerlines
  - Lakes
  - Ponds
  - Ditches, canals, laterals, and other sources contributing to the floodplain delineations included in the DFIRM study.
- Flood Hazard Features
  - 1% annual chance flood hazard areas (100 year flood hazard), including shallow flooding areas
  - 0.2% annual chance flood hazard areas (500 year flood hazard)
  - Floodway
  - Flood structures: dams, levees, bridges, culverts, etc.
  - Cross Sections
  - Base Flood Elevation Lines
- Corporate Limits
  - Corporate Boundaries
  - Annexations
  - Extra Territorial Jurisdictions
  - State or National Parks and Forests
  - Airports
  - Any other accurate boundary file defining jurisdictional limits
- Public Land Survey System
  - Township, Range, and Section boundaries
- Survey Benchmarks
  - Exact coordinates and identification of any locally used benchmarks that are desired to be placed on the DFIRM.
- Topographic Data
  - Detailed contours suitable for floodplain delineation – preferably in a digital format
  - Digital topographic surface (DEM, TIN, or other) suitable for floodplain delineation
- Aerial Orthophotography
  - Most recent ortho-rectified aerial imagery referenced to a common coordinate system and projection

We are not looking for:

- Utilities
- Building footprints
- Parcels
- Right-of-way or easements

GENERAL INFO						STUDY LEVEL			EXISTING DATA				STUDY NEEDS			MNUSS					
Comm	Flooding Source	Initial Priority	Start	End	Approx. Reach Length (mi.)	Zone A?	Limited Detail?	Detail w/ floodway?	Existing FEMA studies	2' topo	5' topo	Other Engineering Studies	Topo/ Survey	Hydro	Hydraul	Panels	C in Hydraul	C in Hydro	C in Fl Wdth	C in BFE	Ave F/p Width
eg. Poctown	Plum Creek	2	conf. w. Red River	2nd Street	2.5 mi	`	x	`	`	`	x	`	`	x	x	0080	`	x	x	1	500 ft
RAVALLI CO	E&W Fort Bitterroot River XDS	1							`	?	?	NRCS	no	no	no		X	X	X	2	
RAVALLI CO	Nez Pierce Creek XDS	2							`	?	?	USACE	no	no	no						
RAVALLI CO	Burnt Fork XDS ?	3								?	?	karl?									
RAVALLI CO	Skalkaho Creek XDS ?	4								?	?	karl?									
RAVALLI CO	Eightmile Creek	5			5 mi	x	x	X		?	?	`									
RAVALLI CO	Three Mile Creek	6			5 mi	x	x	X		?	?	`									
RAVALLI CO	Ambrose Creek	7			5 mi	x	x	X		?	?	`									
RAVALLI CO	Willow Creek	8			5 mi	x	x	X		?	?	`									

AGENDA

Ravalli County DFIRM Scoping Meeting
Ravalli County Administrative Center, 215 S. $th St., Commissioner's Mtg Room, 3rd Flr.
Tuesday, May 23, 2006, 1:30 p.m.

Welcome and Introductions – 5 min.
Montana DNRC
FEMA
PBS&J and High Star Consulting
Ravalli County
City of Hamilton
Town of Darby

Meeting Goals – 5 min.

Local Goals
Project Goals

Presentation: Map Mod Overview and DFIRM Project Process – 20 min.

Timeline and Budget – 5 min.
Timeline
Budget: FEMA, MT DNRC, Local

Panelization – 5 min.
USGS Quad-based

Discussion: Floodplain Restudy Prioritization
Review of Highest Priority Restudy Needs
Next Steps
Wait ☺
County Selection
Project Contracting
Project Kickoff, Data Collection
Close

FACT SHEET: RAVALLI COUNTY

COUNTY AND COMMUNITY CONTACTS
Ravalli County – Laura Hendrix, FPA; Ken Miller, GIS
City of Hamilton – Land Hansen, FPA
Town of Darby – Rick Scheele, FPA

EFFECTIVE FIRMS AND FIS TEXTS
Ravalli County: FIS, FIRM last update September 1998
City of Hamilton: last update September 1998
Town of Darby: original FIRM from September 1998

KNOWN NON-FEMA STUDIES (XDS)
E&W Fork Bitterroot River, NRCS
NezPierce Creek, USACE
Burnt Fork ?
Skalkaho Creek ?

LOCALLY - IDENTIFIED MAPPING NEEDS
Eightmile Creek, 5 miles
Three Mile Creek, 5 miles
Ambrose Creek, 5 miles
Willow Creek, 5 miles

PREVIOUSLY – IDENTIFIED MNUSS NEEDS
East Fork Bitterroot River (2005), 40 miles: new study
West Fork Bitterroot River (2005), 100 miles: new study
Bitterroot River (2005), 2 miles: bridge rebuilt near Victor at Bell Crossing that has altered the flow of the river

LOMRs TO BE INCORPORATED
None

IDENTIFIED BASE MAP AND TOPO DATA
Road and Railroad Centerlines, U.S. Census TIGER
Stream Centerlines, U.S.G.S. National Hydrography
LiDAR mapping through grant (proposed)

RAVALLI COUNTY SCOPING MEETING NOTES

Ravalli County Administrative Center, 215 S. $th St., Commissioner's Mtg Room, 3rd Flr.
Tuesday, May 23, 2006, 1:30 p.m.

Attendees

MT DNRC – Millie Bowman, Karl Christians, Larry Schock

PBS&J – Dan March, Carrie Higinbotham

High Star Consulting – Karen Price

Ravalli County – Laura Hendrix, Ken Miller, Greg Chilcott, James McCubbin, Karen Hughes

Local Media – Antony Quirihi

Overview

The meeting was opened by Dan March, and then turned over to Karen Price. All attendees introduced themselves. Karen noted that some of the meeting goals were to provide information to the attendees about Map Modernization and to learn from them about desired changes to their local maps. Backed by a presentation, Karen and the project team discussed:

- Map Modernization from a Federal, State, and local level,
- Montana's ongoing DFIRM projects
- The DFIRM process, how communities could be involved, and local base map data contributions,
- Applications and uses of the DFIRM,
- Project timeline, and
- Project budget and local and State funding expectations.

Following the presentation, all attendees gathered around a panelization map to view the anticipated panel scheme for the DFIRM. Finally, the group documented all mapping needs using the scoping map and some markers, particularly those areas needing study or restudy, and prioritized them.

During the meeting, community representatives talked about issues unique to their FIRM panels and/or county and potential obstacles to the DFIRM development. These were recorded and are noted below. Once it was explained to the community representatives that they would be contacted again once the start date for the project was determined, the meeting was closed.

Potential Obstacles and Unique Issues

Ravalli County has several important issues to consider when determining the project scope, budget, and timing. There are extensive Zone D areas throughout the county that need conversion to a defined SFHA and the county is attempting to develop quality topographic data on a countywide basis.

The Zone D areas are seen on the majority of the panels, and provide a total of 770 miles of "undefined" flood hazard areas. These Zone D areas are very unusual in that they actually do define an area around the flooding sources and seem very similar to a typical Zone A delineation, but they are labeled as Zone D. There is considerable development along these flooding sources and it is the county's top priority that these Zone D areas be converted to Zone A. It is roughly estimated that if these Zone D areas were treated as a standard Zone A study, it would cost over $1M to map. It is suggested that the Zone D areas be simply relabeled as Zone As for the new map, with ample time for local review and comment on the delineations. Changes could be made to the delineations as appropriate by the study contractor based on recommendations by the community, and the cost to provide these approximate zones could be minimized. It would be important to support the communities and county with a strong outreach program designed to educate homeowners and developers who would be affected by the Zone D to Zone A changes.

A second key issue for the county is their interest and action toward developing 1 ft contour data. Through a grant with MT DNRC, they hope to develop LiDAR data for the northern half of the county beginning in the summer of 2007. If funding continues to be approved, the southern half of the county would be flown in 2008. The data would likely be ready for use by the early winter of 2008. It is suggested that Ravalli County be considered for project start in 2008, so this data can be used for the project.

General Scope

The panelization scheme reveals an estimated 39 printed and 68 non-printed (107 total) panels in the DFIRM as a result of the digital conversion, with a rough cost of about **$180,000**. Studies or restudies could impact the number of panels for the DFIRM. There are no LOMRs to be incorporated.

There are two XDSs to be incorporated as part of the digital conversion that require FEMA approval. The flooding sources for which flood hazard data is available through these two XDSs are:

- East Fork Bitterroot River – about 25 miles from the confluence with the main stem to the Springer Memorial as studied by the NRCS,
- West Fork Bitterroot River – about 21 miles from the confluence with the main stem to the Painted Rocks Dam as studied by the NRCS, and
- Nez Perce Creek –from just below the confluence with the Little West to the West Fork Bitterroot River, about 3.4 miles, as studied by the USACE.

Two other XDS for Burnt Fork and Skalkaho Creek are being reviewed by the DNRC and considered for incorporation. Two additional undisclosed XDS have been included in the cost estimate. Assumptions used for the cost estimate include:

number of DFIRM panels		39
number of DFIRM index		1
number of floodprone communities		4
DOQ or Vector Mapping?		DOQ
Miles of existing approximate A zone to redelineate		0
Miles of existing detailed AE Zone to redelineate		0
Miles of existing detailed with BFEs		65
number of effective profiles		15
number of effective Floodway Data Tables		5
number of LOMRs to incorporate		7
number of effective FIS		1
number of effective FIRM panels		16
number of FIS pages		45
estimated cost/panel DFIRM Conversion (prelim)	**$**	**3,264.95**
estimated cost/panel DFIRM Conversion (post-prelim)	**$**	**1,238.75**
Total estimated DFIRM Conversion cost	**$**	**180,148.10**

The County identified many areas for restudy; the top priorities are:

- About 715 miles of about 80 flooding sources covering almost the entire FIRM of delineated Zone D areas that are requested to be relabeled (or restudied if necessary) as Zone A areas. If these areas require restudy, estimated cost is **$262,100** ($367/mile). Assumptions for the cost estimate include:
    - Hydraulic model to be used;
    - Existing topographic data is adequate;
    - Bridges will not be analyzed; and
    - USGS gaging data or regression equations will be used.

- Detail study on Eightmile Creek from the confluence with Bitterroot River to the USFS Boundary, about 8 miles (currently shown as a delineated Zone D). Estimated cost is **$107,300** ($13,410/mile). Assumptions for the cost estimate include:
    - New hydraulic model from scratch;
    - Existing topographic data is adequate and will be supplemented with 10 newly surveyed cross sections per mile;
    - Seven bridges will be analyzed;
    - USGS gaging data or regression equations will be used;
    - Modeling floodway for 100-year return event (only).

- Detail study on Three Mile Creek from the confluence with Bitterroot River to the USFS Boundary, about 14 miles (currently shown as a delineated Zone D). Estimated cost is **$185,500** ($13,2500/mile). Assumptions for the cost estimate include:

- New hydraulic model from scratch;
- Existing topographic data is adequate and will be supplemented with 10 newly surveyed cross sections per mile;
- Sixteen bridges will be analyzed;
- USGS gaging data or regression equations will be used;
- Modeling floodway for 100-year return event (only).

- Detail study on Ambrose Creek from the confluence with Three Mile Creek to the USFS Boundary, about 9 miles (currently shown as a delineated Zone D). Estimated cost is **$117,300** ($13,030/mile). Assumptions for the cost estimate include:
  - New hydraulic model from scratch;
  - Existing topographic data is adequate and will be supplemented with 10 newly surveyed cross sections per mile;
  - Seven bridges will be analyzed;
  - USGS gaging data or regression equations will be used;
  - Modeling floodway for 100-year return event (only).

- Detail study on Dry Gulch Creek from the confluence with the Bitterroot River to the USFS Boundary, about 8 miles (currently shown as a delineated Zone D). Estimated cost is **$109,300** ($13,660/mile). Assumptions for the cost estimate include:
  - New hydraulic model from scratch;
  - Existing topographic data is adequate and will be supplemented with 10 newly surveyed cross sections per mile;
  - Eight bridges will be analyzed;
  - USGS gaging data or regression equations will be used;
  - Modeling floodway for 100-year return event (only).

- Detail study on Willow Creek from the confluence with the Bitterroot River to the USFS Boundary, about 10 miles (currently shown as a delineated Zone D). Estimated cost is **$139,300** ($13,930/mile). Assumptions for the cost estimate include:
  - New hydraulic model from scratch;
  - Existing topographic data is adequate and will be supplemented with 10 newly surveyed cross sections per mile;
  - Thirteen bridges will be analyzed;
  - USGS gaging data or regression equations will be used;
  - Modeling floodway for 100-year return event (only).

A complete list of the Zone D areas was provided at the scoping meeting and was added to the existing data submittal (see Existing FEMA Data). Additional restudy needs are listed on the Data Collection Worksheet.

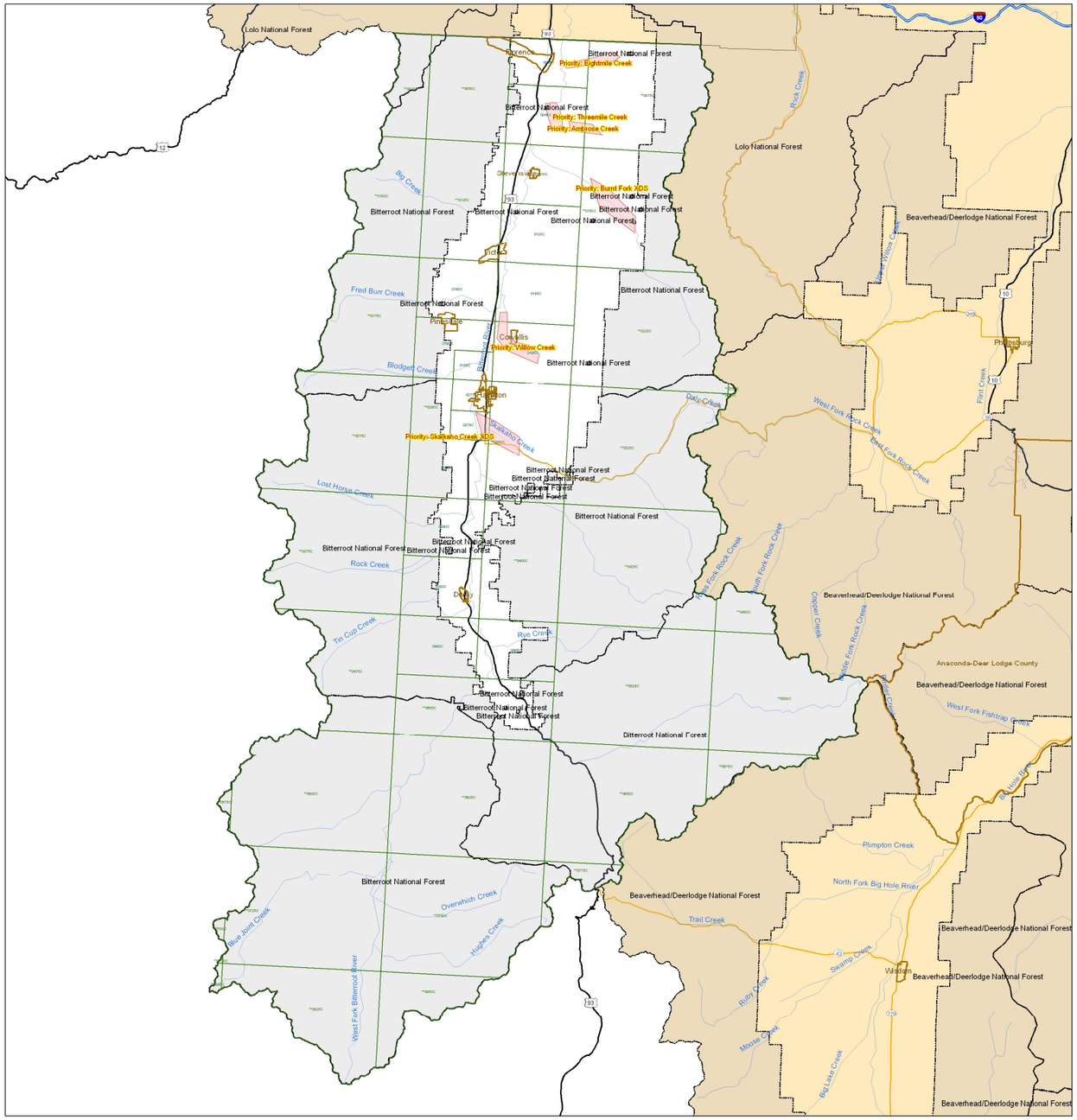
A DFIRM project including these needs is estimated at approximately: **$1,101,000.**

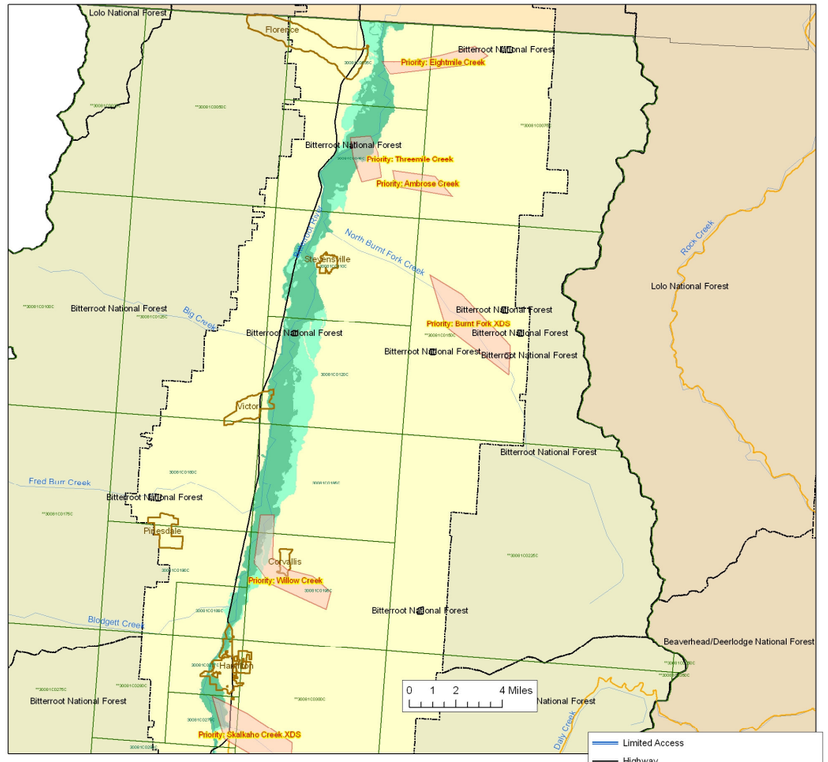
Funding

The county was not able to indicate at this time how much, if any, funding they could contribute toward the DFIRM project.

Ravalli County
Scoping Map

39 of 107 Panels Printed



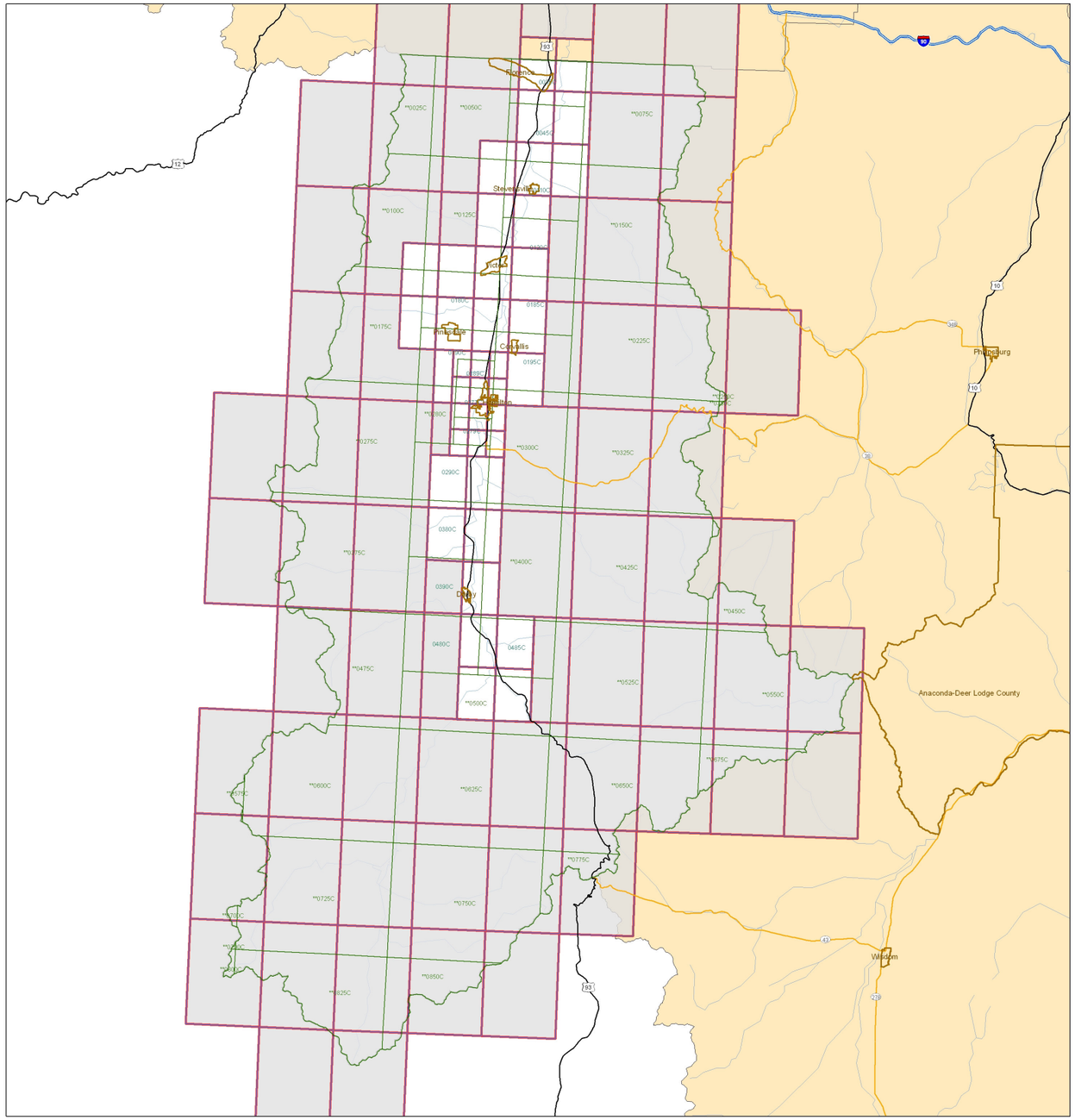


GENERAL INFO						STUDY LEVEL			EXISTING DATA			STUDY NEEDS			MNUSS					
Comm	Flooding Source	Initial Priority	Start	End	Approx Reach Length (mi.)	Zone A?	Limited Detail?	Detail w/ floodway?	Existing FEMA studies	2' topo	5' topo	Other Engineering Studies	Topo/ Survey	Hydro	Hydraul	Panels	C in Hydraul	C in Hydro	C in Fl Width	C in BFE	Ave Flp Width
eg. Pictown	Plum Creek	2	Confl. w. Red	2nd Street	2.5 mi		x				x			x	x	0080		x	x	1	500 ft
RAVALLI CO	E&W Fork Bitterroot River XDS	1								?	?	NRCS	no	no	no		X	X	X	2	
RAVALLI CO	Nez Pierce Creek XDS	2								?	?	USACE	no	no	no						
RAVALLI CO	Burnt Fork XDS ?	3								?	?	kurt?									
RAVALLI CO	Skalkaho Creek XDS ?	4								?	?	kurt?									
RAVALLI CO	Eightmile Creek	5			5 mi	x	x	X		?	?	`									
RAVALLI CO	Three Mile Creek	6			5 mi	x	x	X		?	?	`									
RAVALLI CO	Ambrose Creek	7			5 mi	x	x	X		?	?	`									
RAVALLI CO	Willow Creek	8			5 mi	x	x	X		?	?	`									

- Limited Access
- Highway
- Major Road
- Local Road
- Simplified Streams (Census 2002, from NRIS)
- Effective Panels (** indicates Panel Not Printed)
- 2000 Census Designated Places
- National Forests (from NRIS)
- Priorities Ravalli County
- Other Counties
- Ravalli County

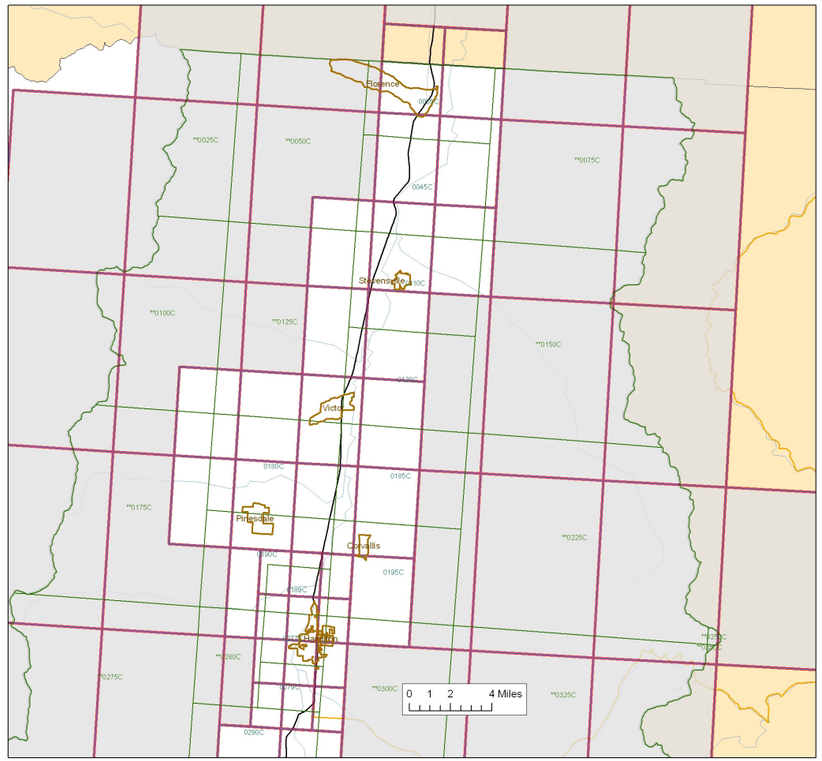
Q3 Flood Hazard Areas

0 3 6 12 Miles



Ravalli County
Preliminary Panel Scheme

39 of 107 Panels Printed



Other Counties
Ravalli County

Preliminary Panel Scheme

Panel Not Printed
Panel Printed
Simplified Streams (Census 2002, from NRIS)
Effective Panels (** indicates Panel Not Printed)
2000 Census Designated Places

0 3 6 12 Miles

DATA COLLECTION WORKSHEET

GENERAL INFO						STUDY LEVEL			EXISTING DATA				STUDY NEEDS			MNUSS					
Comm	Flooding Source	Initial Priority	Start	End	Approx. Reach Length (mi.)	Zone A?	Limited Detail?	Detail w/ floodway?	Existing FEMA studies	2' topo	5' topo	Other Engineering Studies	Topo/ Survey	Hydro	Hydraul	Panels	C in Hydraul	C in Hydro	C in Fl Wdth	C in BFE	Ave F/p Width
RAVALLI CO	E Fork Bitterroot River	XDS	confl w/ Main Stem	Springer Memorial	25 mi			X		1 ft *		NRCS				485, 500, 625, 650, 525, 550					
RAVALLI CO	W Fork Bitterroot River XDS	XDS	confl w/ Main Stem	Painted Rocks Dam	21 mi			X		1 ft *		NRCS				485, 480, 500, 625, 750, 725					
RAVALLI CO	Nez Perce Creek	XDS	Mile 3.4 just below confluence with Little West	West Fork Bitterroot River	3.4 mi	X				1 ft*		USACE				600, 625					
RAVALLI CO	80 sources	1	see list attached		750 mi	X			***Defined*** Zone D	1 ft *						all			X	+5	500 ft
RAVALLI CO	Eightmile Creek	2	Confl w/ Bitterroot River	USFS Bdry	8 mi			X	***Defined*** Zone D	1 ft *			x*	x	x	55, 75	X	X	X	+5	500 ft
RAVALLI CO	Three Mile Creek	3	Confl w/ Bitterroot River	USFS Bdry	14 mi			X	***Defined*** Zone D	1 ft *			x*	x	x	45	X	X	X	+5	500 ft
RAVALLI CO	Ambrose Creek	4	Confl w/ Three Mile Creek	USFS Bdry	9 mi			X	***Defined*** Zone D	1 ft *			x*	x	x	45, 75	X	X	X	+5	500 ft
RAVALLI CO	Dry Gulch Creek	5	Confl w/ Bitterroot River	USFS Bdry	8 mi			X	***Defined*** Zone D	1 ft *			x*	x	x	45	X	X	X	+5	500 ft
RAVALLI CO	Willow Creek	6	Confl w/ Main Stem	USFS Bdry	10 mi			X	***Defined*** Zone D	1 ft *			x*	x	x	185, 195	X	X	X	+5	500 ft
RAVALLI CO	Main Stem	7	Northern county line	Confl w/ E&W Fork	65 mi			X		1 ft *			x*		x	485, 480, 390, 380, 290, 279, 277, 189, 190, 180, 120, 110, 45, 35	X		X	-0-1	4000 ft
Comm	**Flooding Source**	**Initial Priority**	**Start**	**End**	**Approx. Reach Length (mi.)**	**Zone A?**	**Limited Detail?**	**Detail w/ floodway?**	**Existing FEMA studies**	**2' topo**	**5' topo**	**Other Engineering Studies**	**Topo/ Survey**	**Hydro**	**Hydraul**	**Panels**	**C in Hydraul**	**C in Hydro**	**C in Fl Wdth**	**C in BFE**	**Ave F/p Width**
RAVALLI CO	Burnt Fork	XDS - hold **	Burnt Fork Dam	Bitterroot River	8.5 mi	AO Alluvial Fan				1 ft *		DNRC to locate				150					
RAVALLI CO	Skalkaho Creek	XDS - hold **								1 ft *		DNRC to locate				279, 300					

EXISTING FEMA DATA

A request was sent to the FEMA Library on April 20, 2006, for the following:

- Flood Insurance Study Data
- Topographic Mapping
- Flood Insurance Study Survey Notes
- Digital Line Graph or Digital Flood Insurance Rate Map Files
- Flood Insurance Study Text in a Digital, Editable Format
- Future Files in a Digital Format

On May 15, 2006, the following email was received in response.

From: Carleen Woo <Carleen.Woo@mapmodteam.com>

Date: May 15, 2006 10:40:45 AM MDT

To: highstarconsulting@mac.com

Subject: FEMA Request B0608079

Karen,

All the information for Ravalli County, MT has been burned onto a cd, and will be mailed today. There is modeling for Bitterroot River, which was from a LOMR: 99-08-179P. Data for Bitterroot River verifies for cross sections A-DL, and data for Left Branch of Bitterroot River verifies for cross sections A-D. Survey notes were found on microfiche, and scanned into a pdf file. The blowbacks of the survey notes will also be sent. Workmaps were also scanned into both pdf and tiff files. If you have any questions regarding this case, you can email me at this address.

Carleen Woo
Analyst
FEMA Flood Data Library
Alexandria, VA

The modeling was received for the Bitterroot River and the LOMR. Survey notes and workmaps were also received for the county.

On May 25, 2006, another email from the FEMA Library reported that Future Files had been located for Ravalli County, but none had been found for Darby, Hamilton, Pinesdale, or Stevensville.

It was noted that contractors could obtain copies of the FIS text and FIRM panels through download from the Map Service Center.

All data herein described (and a copy of Zone D areas from the county) was forwarded to Millie Bowman at the MT DNRC under separate cover.

EXISTING GIS AND BASE MAP DATA

Ravalli County
Ken Miller
5/23/2006

Data Type		Available?	How created?	Updated?	Scale	Meets FEMA spec?	Metadata?
Transportation	Roads & Railroads	yes	collected using GPS and digitized frpm DOQQs	frequently	25 ft horizontal accuracy	yes	no
Flooding Sources	Streams	yes	rectified and digitized using DOQQ or 2004 imagery, goal is to get data to meet TIGER specifications	occasionally	n/a	no	yes
Flood Hazard	Scanned Flood Workmaps	yes	scanned the workmaps used to produce the effective FIRMS, then georefernced them to aerial photos (workmaps have an aerial photo base map, so registration/rectification was very accurate). Only floodplains (not cross sections or structures) were digitized, but georeferenced maps are available	no	variable	possibly	methodology would need to be written up
Corporate Boundaries	Community boundaries	yes	n/a	occasionally	n/a	no	no
PLSS	GCDB	yes	GCDB is very accurate in the North part of County (where most of the population is) Accuracy decrease in southern part of County.	occasionally	n/a	no	yes
Survey/Benchmarks	none						
Topography	USGS DEMs	yes	USGS DEMs	no	1:24000	no	yes
Ortho/Aerial Photography	2005 State NAIP Imagery	yes	flown by NAIP	no	1m pixel 38ft RMSE	yes	yes

Notes:

SCOPE COST ESTIMATE

Comm	Flooding Source	Initial Priority	Approx. Reach Length (mi.)	Zone A?	Limited Detail?	Detail w/ floodway?	Topo/ Survey	Hydro	Hydraul	Draft Cost Estimate
RAVALLI CO	W Fork Bitterroot River XDS	XDS	21 mi			X				$0
RAVALLI CO	Nez Perce Creek	XDS	3.4 mi	X						$0
RAVALLI CO	E Fork Bitterroot River	XDS	25 mi			X				$0
RAVALLI CO	80 sources *	1	750 mi	X						$0
RAVALLI CO	Eightmile Creek	2	8 mi			X	x	x	x	$107,300
RAVALLI CO	Three Mile Creek	3	14 mi			X	x	x	x	$185,500
RAVALLI CO	Ambrose Creek	4	9 mi			X	x	x	x	$117,300
RAVALLI CO	Dry Gulch Creek	5	8 mi			X	x	x	x	$109,300
RAVALLI CO	Willow Creek	6	10 mi			X	x	x	x	$139,300
RAVALLI CO	Main Stem **	7	65 mi			X	x		x	$715,000
								TOTAL		$1,351,000

* Costs based on relabeling all Zone Ds as Zone As

** Costs based on doing complete restudy, option to do a conversion from existing WixPro to HEC-RAS

MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION COOPERATING TECHNICAL PARTNERS MAPPING ACTIVITY STATEMENT

Mapping Activity Statement No. 2006-04 – Digital Flood Insurance Rate Map Production and Development of Updated Flood Data for Ravalli County

In accordance with the Cooperating Technical Partners (CTP) Partnership Agreement dated Mar 18, 2005, between the Montana Department of Natural Resources and Conservation (DNRC) and the Federal Emergency Management Agency (FEMA), Mapping Activity Statement (MAS) No. 2006-04 is as follows.

SECTION 1—OBJECTIVE AND SCOPE

The objective of the Flood Map Project documented in this MAS is to develop a Digital Flood Insurance Rate Map (DFIRM) and Flood Insurance Study (FIS) report for Ravalli County. The DFIRM and FIS report will be produced in the FEMA countywide Format using vertical datum NAVD 88.

Existing GIS data and study needs for the community will be researched, obtained, organized and provided in accordance with Activity 1. Scoping will be necessary to determine the final scope of work for this project.

In addition the Mapping Partners involved in this project will develop new and/or updated flood hazard data, as summarized in the table below.

Table 1.1 Flooding Source(s) to be Studied

Priority	Flooding Source	Reach Limits	Reach Length	Detailed Riverine		Limited Detail Study	Redeline-ation of SFHAs Using Effective Profiles and New Topography	Refine/ Establish Zone A
				Hydrology	Hydraulics			
1	80 Sources	See MT DNRC for list	715 miles	n/a	n/a	n/a	n/a	X
2	Eightmile Creek	Confluence with Bitterroot River to USFS boundary	8 miles	X	X	n/a	n/a	n/a
3	Three Mile Creek	Confluence with Bitterroot River to USFS boundary	14 miles	X	X	n/a	n/a	n/a
4	Ambrose Creek	Confluence with Bitterroot River to USFS boundary	9 miles	X	X	n/a	n/a	n/a
5	Dry Gulch Creek	Confluence with Bitterroot River to USFS boundary	8 miles	X	X	n/a	n/a	n/a
6	Willow Creek	Confluence with Bitterroot River to USFS boundary	10 miles	X	X	n/a	n/a	n/a

This Flood Map Project will be completed by the following

- Montana DNRC;
- DNRC's contractor;
- Michael Baker, Jr., Inc., the FEMA National Service Provider (NSP); and
- FEMA Region VIII.

The CTP shall notify FEMA and/or their contractor by e-mail of all meetings with community officials at least one week prior to the meeting (with as much notice as possible). FEMA and/or their contractor may or may not attend the community meetings
The activities for this Flood Map Project, including required Quality Assurance/Quality Control (QA/QC) reviews, and the Mapping Partners that will complete them are summarized in the table below. The sections of this MAS that follow the table below describe the specific activities, responsible Mapping Partner(s), FEMA standards that must be met, and resultant map components.

Table 1.2 Flood Mapping Project Activities

Activities	CTP	FEMA
Scoping	X	
Outreach	X	
Field Survey	X	
Independent QA/QC Review of Field Survey		X
Topographic Data Development	X	
Independent QA/QC Review of Topographic Data		X
Base Map Acquisition and Preparation	X	
Hydrologic Analyses	X	
Independent QA/QC Review of Hydrologic Analyses		X
Hydraulic Analyses (including Levee Evaluation, if applicable)	X	
Independent QA/QC Review of Hydraulic Analyses		X
Floodplain Mapping (Detailed Riverine, Redelineation Using Effective Flood Profiles and Updated Topographic Data[1], Refinement or Creation of Zone A, Redelineation (digitization) of Non-Revised Areas[1], Merge Revised and Non-Revised Information)	X	
Independent QA/QC Review of Floodplain Mapping		X
Redelineation (Redelineation Using Effective Flood Profiles and Updated Topographic Data[1], Refinement and Redelineation (digitization) of Non-Revised Areas[1])		
Independent QA/QC Review of Redelineation		
Develop DFIRM Database (including Graphic Specifications)	X	
Independent QA/QC Review of DFIRM Database and Graphics		X
Produce Preliminary Map Products	X	
Post-Preliminary Processing	X	X
[1]These sub-tasks can be performed and reported in the Management Information Portal (MIP) Work Flow as part of Floodplain Mapping activity or Redelineation activity.		

FEMA has developed tools to assist in the development of the flood hazard data studies and DFIRMs if the DNRC wishes to use them. FEMA will provide all DNRC's contractors access to and training in these tools. The tools available at this time include WISE software and the DFIRM production tools. The use of these tools will improve the Flood Map Modernization and efficiency of all mapping partners.

QA/QC review activities may be performed by the CTP or the NSP at the discretion of FEMA. Please note FEMA will also be performing periodic audits and overall study/project management to ensure study quality.

FEMA will be providing download/upload capability for intermediate data submittals through the MIP. Data submittals uploaded via the MIP will include the same data required prior to the existence of the MIP, with the addition of Metadata profiles required for search and retrieve capabilities. A Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance.

Metadata profiles are to be included with each of the following four activities that must satisfy Data Capture Standards; Base Map Data, Topographic Data, Hydrologic Data, and Hydraulic Data. The metadata profiles are available from FEMA.

Compliance with Floodplain Boundary Data Quality Standards: The data quality standards documented in Section 7 of the Multi-Year Flood Hazard Identification Plan (MHIP) for Fiscal Year 2004-2008 (Version 1, November 2004) should be used as the basis for producing DFIRMs. The MIP utilities available at the time of study submittals should be run to verify compliance with these data quality standards. Compliance with these standards will help FEMA achieve a Map Modernization goal of providing a reliable, web-based national flood layer in digital GIS format.

The floodplain boundary data quality standards outlined in Table 7-1 of the MHIP should be followed in addition to existing standards specified for floodplain mapping in the Guidelines, including Volume I, Section 1.4 and Appendices C, D, E, F, G, H, K, L, M, and N. Table 7-1 shall be applied to all approximate, existing detailed and new detailed studies for riverine flooding sources.

FEMA will be providing download/upload capability for intermediate data submittals through the Management Information Portal (MIP). Data submittals uploaded via the MIP, will include the same data required prior to the existence of the MIP.

Scoping

Responsible Mapping Partner: DNRC and FEMA/NSP

Scope: This task involves collecting and reviewing data from a variety of sources including community surveys, other Federal and State Agencies, NFIP State Coordinators, Community Assistance Visits (CAV's) and FEMA archives. DNRC will evaluate the effective FIS report and FIRM maps to see if it needs to be updated. DNRC will provide lists of mapping needs from the MNUSS database, the Scoping Tool, and community surveys and CAV's if available.

Data collection will be performed by FEMA/NSP, including the initial population of the Scoping Tool. This task includes obtaining the best available base map materials (e.g. corporate limits, roads, orthophotos, etc) along with stream centerline files. The acquired data will be imported into the scoping tool and used during the Scoping Task. In the Scoping Tool all streams should have unique names, the limits of the

effective FEMA studies should be identified, LOMC areas should be identified, and community requests should be identified. This task also includes populating the streamlines with existing pipeline and scoped studies currently underway.

Identify all stream reaches where levees are shown as providing protection against the 1-percent-annual-chance flood. Request the information specified in Title 44 Code of Federal Regulations (CFR) 65.10, Mapping of areas protected by levee systems, from the community or other party seeking continued recognition of the levee.

In cooperation with the FEMA Region, a Project Management Team will be established consisting of FEMA, NSP, the DNRC, the DNRC contractor, officials from each community being studied, and other appropriate stakeholders. The Project Management Team will be responsible for coordinating the activities of this project and completing all tasks identified in this Statement of Work.

If the Special Flood Hazard Area (SFHA) is proposed to be mapped as contained by a levee on a new FIRM then the requirements of 44 CFR 65.10 must be provided to FEMA regardless if the flooding source is proposed to be restudied or not. All levee systems impacting existing and proposed SFHAs shall be identified during this task and relevant information on the levee's ownership, structure (including freeboard, stability, seepage, closure, etc.), maintenance, operations, and interior drainage shall be obtained and inventoried. For all levees proposed to be shown on the new FIRM as providing protection from the 1-percent-annual-chance flood (i.e., those known to have adequate freeboard, available as-built plans, adequate maintenance, and operation plans, etc.) that do not have certification documentation available, the levee owner and/or community(s) protected shall be contacted by FEMA via letter requesting the missing requirement(s) of 44 CFR 65.10. During this step, the time frame for providing the requested data shall be established in coordination with the FEMA Regional Office. If certification, plans, etc. are not provided within the established timeframe, then the need for new flood hazard analysis/mapping shall be documented. At the end of this task, FEMA's Flood Levee Inventory System must be updated for all levees identified by the FEMA/NSP.

Preliminary Research Activities can be separated into two categories—researching effective information and researching available data for the Flood Map Project. The following information shall be collected if needed and reviewed: FEMA archive inventory of effective FIRM panels, FBFM panels, FIS reports, and other flood hazard data or existing study data; summary of information in the MNUSS database; summary of contiguous community agreement checks; CAV and CAC files; and "scoping map" and an overview of the results of the research. The DNRC has already compiled most of this information in a Scoping Report.

The DNRC will coordinate, set-up, and hold the Scoping Meeting. This includes identifying a time, place, and all participants. The purpose of this meeting is to present the current information to the local officials (state, county and municipal) and coordinate on prioritization and identification of study areas. The DNRC shall be responsible for compiling the necessary information for the meeting. These items may include: FIS and FIRM for affected communities; USGS quads for the study area; best available community base map(s); effective FIRM summary; Available Data Inventory; Scoping Map; Scoping Meeting Agenda/Minutes form; Aerial photos/topographic mapping if available; existing drainage studies or other H&H data; Community master plan(s)/Drainage Master Plan(s); Zoning Maps; Street Maps; As-built plans; and Floodplain Ordinance(s).

The project management team shall review the initial mapping needs list, review the research findings, and make selections of proposed methods for obtaining/producing flood data. Any additions or changes to the needs list shall be discussed with all members. All needs shall also be prioritized. In general, highest

priority shall be given to the following areas: areas of dense existing or anticipated development, including areas where new road crossings have been constructed over stream(s); areas affected by flood-control structures and/or channelization; areas where natural physical changes in the floodplain have been significant (due to subsidence or extreme erosion, for example); areas that were studied by approximate methods and unmapped areas, especially those with development pressure; areas where the community has experienced flooding outside mapped floodplains, with severe damage to buildings and/or infrastructure; areas where mapped flood hazards do not match those shown on contiguous FIRMs (unless those FIRMs are not considered to be accurate); and areas where flood data (BFEs, floodplains, and regulatory floodways) are likely to be changed the most by a restudy.

Based on the discussion of mapping needs, the DNRC and FEMA Project Officer will finalize the areas to be included in the project (based on recommendations provided by the Project Team). Areas to be studied by detailed and approximate methods shall be identified. The following issues will be discussed and refined: Review and Refinement of Flood Hazard Identification Methodologies, Review of Proposed Paneling Scheme, Review and Refinement of Base and Topographic Map Source, and Finalization of Map Production and Database Options.

The FEMA Regional Officer will hold the role of the Consultation Coordination Officer (CCO) for this flood study as identified in Title 44 of the Code of Federal Regulations Part 66. At this point, the FEMA will prepare and set up the Community Case File and Flood Elevation Docket for the maintenance of all communication and coordination throughout the project as outlined in 44CFR Part 66 and 67.

Standards: All Scoping work shall be performed in accordance with the standards specified in Section 5 of this MAS.

Deliverables: The DNRC shall make the following products available to FEMA:

- The Final Scope of work will be delivered to the Regional Project Officer.
- QA/QC Plan for the review of the mapping project outlined in this MAS. This will include the checklists developed for that review in accordance with the schedule included in Section 6 of this MAS.
- The MIP shall be updated for status reporting not less than prescribed quarterly periods and when the Scoping activity is complete.

OUTREACH

(NOTE: The performance of outreach takes place throughout the life of the flood study project. Therefore, we recommend that the tracking of outreach as a function of the MIP Workflow will be distributed amongst the following activities: Scoping, Produce Preliminary Map Products and Post Preliminary Processing.)

The outreach activities for a Flood Map Project can best be understood as a process that begins during the Project Scoping phase and continues through the Map Production and Post-preliminary phases.

The overarching goal for conducting outreach is to create a climate of understanding and ownership of the mapping process at the State and local levels. Well-planned outreach activities can reduce political stress, confrontation in the media, and public controversy, which can arise from lack of information, misunderstanding, or misinformation. These outreach activities also can assist FEMA and other members of the Project Team in responding to congressional inquiries.

By proactively reaching out to all key stakeholders as early in the Flood Map Project as possible, the maps can be used to their full potential. The likelihood of appeals may also be reduced or eliminated. Specific responsible Mapping Partner activities shall include, but are not limited to:

- Establishing two-way communication to address the needs of, inform and obtain feedback from, the stakeholders;
- Ensuring compliance with due process requirements;
- Interacting with technical representatives to ensure production of accurate and up-to-date maps;
- Enhancing ownership by communities; and
- Tracking, monitoring, and evaluating outreach activities and adjusting efforts according to ongoing feedback and evolving project needs.

All communication with local governments will be done in accordance with Title 44 Code of Federal Regulations Part 66.

Field Survey

Responsible Mapping Partner: DNRC

Scope: To supplement any field reconnaissance conducted during the Project Scoping phase of this project, the DNRC shall conduct an appropriate and necessary level of field reconnaissance of the specific study area to determine conditions along the floodplain(s), types and numbers of hydraulic and/or flood-control structures, apparent maintenance or lack thereof of existing hydraulic structures, locations of cross sections to be surveyed, and other parameters needed for the hydrologic and hydraulic analyses.

In addition to the initial field reconnaissance, the DNRC shall conduct field surveys as needed, including obtaining channel and floodplain cross sections, identifying or establishing Temporary Bench Marks, and obtaining the physical dimensions of hydraulic and flood-control structures. The DNRC also shall coordinate with other Mapping Partners that are involved in the Topographic Data Development process.

Refer to Appendix B, CTP Contractor Scope of Work, for details concerning this Activity.

Prior to uploading any data to the MIP or delivering any data to FEMA/NSP in digital format, the CTP shall have completed a review checklist as available from the NSP, or similar documentation for that data, for this activity.

Standards: All Field Survey work shall be performed in accordance with the standards specified in Section 5 of this MAS.

Deliverables: In accordance with the Technical Support Data Notebook (TSDN) format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, the DNRC shall make the following products available to FEMA by uploading the digital data to the MIP or submitting it to the FEMA Regional Office if the MIP is unavailable at the time of delivery. A Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and

retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. This submittal will occur in accordance with the schedule outlined in Section 6 for this Activity. The MIP shall be updated for status reporting not less than prescribed quarterly periods and when the activity is complete. Where paper documentation is required by State Law for Professional certifications, you may submit the paper in addition to a scanned version of the paper for the digital record.

- A report summarizing the findings of the field reconnaissance;
- Maps and drawings that provide the detailed survey results, if applicable;
- Survey notebook containing cross sections and structural data, if applicable;
- Documentation of the Datum;
- Format Survey Database or Data Delivery consistent with the Data Capture Standards –Appendix N of the *Guidelines and Specifications for Flood Mapping Partners*, and
- A Summary Report that describes and provides the results of all automated or manual QA/QC review steps taken during the preparation of the DFIRM as outlined in approved QA/QC Plan.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at http://www.fema.gov/fhm/dl_cgs.shtm.

Topographic Data Development

Responsible Mapping Partner: DNRC

Scope: To supplement the field surveys conducted under this MAS, the DNRC shall obtain additional topographic data of the overbank areas of the flooding sources studied to delineate floodplain boundaries. The DNRC shall gather the most current topographic data for the given community and determine how it compares to existing conditions and level of accuracy. The DNRC shall use the best available existing topographic data for the flooding sources as listed in Table 1-1.

If there is no new topographic data available that can be used and it is demonstrated that there is a need during the scoping phase, with approval from the Region Project Officer, the DNRC shall generate new topographic data for the flooding sources as detailed in Table 1-1. The DNRC also shall coordinate with other team members conducting field surveys. Contour interval and/or accuracy for the topographic data shall be selected based on the current FEMA requirements as documented in *Guidelines and Specifications for Flood Hazard Mapping Partners*. No FEMA funds shall be expended on new topographic data unless prior approval is given by the Regional Project Officer after analyzing the request submitted at the end of the scoping period.

If appropriate, the DNRC also shall develop topographic maps and/or Digital Elevation Models for the subject flooding sources using the data collected under this topographic data development process and via field surveys. In addition, the DNRC shall address all concerns or questions regarding the topographic data development that are raised by FEMA/NSP during the independent QA/QC review.

Refer to Appendix B, CTP Contractor Scope of Work, for details concerning this Activity.

Prior to uploading any data to the MIP or delivering any data to FEMA/NSP in digital format, the CTP shall have completed a review checklist as available from the NSP, or similar documentation for that data, for this activity.

Standards: All Topographic Data Development work shall be performed in accordance with the standards specified in Section 5 of this MAS.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners* the DNRC shall upload the digital data to the MIP or submit to FEMA by using other digital media if the MIP is unavailable, so that FEMA/NSP can access it for an independent QA/QC review in accordance with the schedule outlined in Section 6 for this Activity. A Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. The MIP shall be updated for status reporting not less than prescribed quarterly periods and when the activity is complete. Where paper documentation is required by State Law for Professional certifications, you may submit the paper in addition to a scanned version of the paper for the digital record.

- Digital topographic maps;
- Report summarizing methodology and results;
- Mass points and breaklines data;
- Digital work maps with contours;
- Checkpoint analyses to assess the accuracy of data, including Root Mean Square Error calculations to support vertical accuracy;
- Identification of remote-sensing data voids and methods used to supplement data voids;
- National Geodetic Survey data sheets for Network Control Points used to control remote- sensing and ground surveys;
- Metadata compliant with Federal Geographic Data Committee standards;
- Documentation of the Datum;
- Format Terrain Database or Data Delivery consistent with the Data Capture Standards –Appendix N of the *Guidelines and Specifications for Flood Mapping Partners*; and
- A Summary Report that describes and provides the results of all automated or manual QA/QC review steps taken during the preparation of the DFIRM as outlined in approved QA/QC Plan.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at http://www.fema.gov/fhm/dl_cgs.shtm.

Independent QA/QC Review of Topographic Data

Responsible Mapping Partner: FEMA/NSP

Scope: FEMA/NSP shall review the mapping data generated by the DNRC under Topographic Data Development to ensure that these data are consistent with FEMA standards and standard engineering practice and are sufficient to prepare the DFIRM. FEMA may audit or assist in these activities if deemed to be necessary by the Regional Project Officer.

This review will be performed in a timely manner so as to eliminate impact to the project schedule.

Standards: All work under Topographic Data Development shall be performed in accordance with the standards specified in Section 5 of this MAS.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, FEMA/NSP shall make the following products available to FEMA and the DNRC by uploading the digital data to the MIP or submitting it to the FEMA Regional Office if the MIP is unavailable and providing it electronically to the DNRC. A Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. This submittal will occur in accordance with the schedule outlined in Section 6 for this Activity. The MIP shall be updated for status reporting not less than prescribed quarterly periods and when the activity is complete.

- A Summary Report that describes the findings of the independent QA/QC review; and
- Recommendations to resolve any problems that are identified during the independent QA/QC review.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at http://www.fema.gov/fhm/dl_cgs.shtm.

Base Map Acquisition

Responsible Mapping Partner: DNRC

Scope: Base Map Acquisition consists of obtaining the digital base map, for the project. The DNRC shall provide the digital base map. The required activities are as follows:

- Obtain digital files (raster or vector) of the base map.
- Secure necessary permissions from the map source to allow FEMA's use and distribution of hardcopy and digital map products using the digital base map, free of charge.
- Certify that the digital data meets the minimum standards and specifications that FEMA requires for DFIRM production.

Refer to Appendix B, CTP Contractor Scope of Work, for details concerning this Activity.

Prior to uploading any data to the MIP or delivering any data to FEMA/NSP in digital format, the CTP shall have completed a review checklist as available from the NSP, or similar documentation for that data, for this activity.

Standards: The Base Map Acquisition shall be performed in accordance with the standards specified in Section 5 of this MAS. The Data Capture Standards must be met for this deliverable to be acceptable.

Deliverables: The MIP shall be updated for status reporting not less than prescribed quarterly periods and when the activity is complete. In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, the DNRC shall make the following products available to FEMA by uploading the digital data to the MIP or submitting it to the FEMA Regional Office if the MIP is unavailable at time of delivery. A Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. The DNRC shall make the following products available to FEMA in accordance with the schedule outlined in Section 6 for this Activity:

- Written certification that the digital data meet the minimum standards and specifications;
- Documentation that FEMA can use the digital base map; and
- Documentation of the Datum, if appropriate.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at http://www.fema.gov/fhm/dl_cgs.shtm.

Hydrologic Analyses

Responsible Mapping Partner: DNRC

Scope: Where hydrologic analyses are required for new or revised studies, the methods and discharge values shall be identified in Appendix B. The flood discharges will then be used as the basis for subsequent hydraulic analyses under Activity 8. The DNRC shall address all concerns or questions regarding Activity 6 that are identified by FEMA/NSP during the independent QA/QC review under Activity 7.

If Geographic Information System (GIS)-based modeling is used, such as for approximate A zones, the DNRC shall document automated data processing and modeling algorithms and provide them to FEMA to ensure they are consistent with the standards outlined above. Digital datasets (such as elevation, basin, or land use data) are to be documented and provided to FEMA for approval before performing the hydrologic analyses to ensure the datasets meet minimum requirements. If non-commercial (i.e., custom-developed) software is used for the analysis, then the DNRC shall provide full user documentation, technical algorithm documentation, and the software to FEMA for review before performing the hydrologic analyses.

Refer to Appendix B, CTP Contractor Scope of Work, for details concerning this Activity.

Prior to uploading any data to the MIP or delivering any data to FEMA/NSP in digital format, the CTP shall have completed a review checklist as available from the NSP, or similar documentation for that data, for this activity.

Standards: All Hydrologic Analyses work shall be performed in accordance with the standards specified in Section 5 of this MAS.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners* the DNRC shall upload the digital data to the MIP or submit to FEMA by using other digital media if the MIP is unavailable, so that FEMA/NSP can access it for

an independent QA/QC review in accordance with the schedule outlined in Section 6 for this Activity. A Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. The MIP shall be updated for status reporting not less than prescribed quarterly periods and when the activity is complete. Where paper documentation is required by State Law for Professional certifications, you may submit the paper in addition to a scanned version of the paper for the digital record.

- Digital copies of all hydrologic modeling (input and output) files for the 10-, 2-, 1-, and 0.2-percent-annual-chance storm events;
- Digital copies of approximate hydrology values and a description of the method used will be made available if requested;
- Digital Summary of Discharges Tables presenting discharge data for the flooding sources for which hydrologic analyses were performed;
- Digital draft text for Section 3.1, Hydrologic Analyses, of the FIS report;
- Digital versions of all backup data used in the analysis, including work maps;
- Format Hydrology Database or Data Delivery consistent with the Data Capture Standards – Appendix N of the Guidelines and Specifications for Flood Mapping Partners; and
- A Summary Report that describes and provides the results of all automated or manual QA/QC review steps taken during the preparation of the DFIRM.
- For GIS-based modeling, deliverables shall include all input and output data, intermediate data processing products, and GIS data layers.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at http://www.fema.gov/fhm/dl_cgs.shtm.

Independent QA/QC Review of Hydrologic Analyses

Responsible Mapping Partner: FEMA/NSP

Scope: FEMA/NSP shall review the technical, scientific, and other information submitted by the DNRC specific to the hydrologic analyses to ensure that the data and modeling are consistent with FEMA standards and standard engineering practice and are sufficient to prepare the DFIRM. FEMA may audit or assist in these activities if deemed to be necessary by the Regional Project Officer. This work shall include, at a minimum, the activities listed below.

- Review the submittal for technical and regulatory adequacy, completeness of required information, and supporting data and documentation. The technical review is to focus on the following:

  - Use of acceptable models;
  - Use of appropriate methodology(ies);
  - Correctly applied methodology(ies)/model(s), including QC of input parameters;
  - Comparison with gage data and/or regression equations, if appropriate; and

- Comparison with discharges for contiguous reaches or flooding sources.

- Maintain records of all contacts, reviews, recommendations, and actions and make them readily available to FEMA;
- Maintain an archive of all data submitted for hydrologic modeling review. (All supporting data must be retained for 3 years from the date funding recipient submits its final expenditure report to FEMA.); and
- If data changed during review, then updated deliverables for previous task will be submitted at this time.

This review will be performed in a timely manner so as to eliminate impact to the project schedule.

Standards: All Independent QA/QC work shall be performed in accordance with the standards specified in Section 5 of this MAS.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, FEMA/NSP shall make the following products available to FEMA and the DNRC by uploading the digital data to the MIP or submitting it to the FEMA Regional Office if the MIP is unavailable at the time of delivery and providing it in digital format to the DNRC. A Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. This submittal will occur in accordance with the schedule outlined in Section 6 for this Activity. The MIP shall be updated for status reporting not less than prescribed quarterly periods and when the activity is complete.

- A Summary Report that describes the findings of the independent QA/QC review and
- Recommendations to resolve any problems that are identified during the independent QA/QC review.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at http://www.fema.gov/fhm/dl_cgs.shtm.

Hydraulic Analyses

Responsible Mapping Partner: DNRC

Scope: DNRC shall perform hydraulic analyses for the specific flooding sources listed in Appendix B of this MAS. For new or revised studies based on detailed analyses, the hydraulic modeling will include the 10-, 2-, 1-, and 0.2 percent-annual-chance events, as well as the regulatory floodway, based on peak discharges computed under Activity 6. For new or revised studies based on approximate or limited detailed analyses, the hydraulic modeling will only include the 1-percent-annual-chance event. The hydraulic methods used for these analyses will involve step backwater calculations performed using a FEMA accepted 1-dimensional model such as the US Army Corps of Engineers Hydraulic Engineering Center River Analysis System (HEC-RAS) computer model, currently version 3.1.2.

The DNRC shall use the cross-section and field data collected during Field Survey to perform the hydraulic analyses. The hydraulic analyses will be used to establish flood elevations and regulatory floodways for the subject flooding sources.

The DNRC may use the FEMA CHECK-2 or CHECK-RAS checking program to check the reasonableness of the hydraulic analyses. To facilitate the independent QA/QC review, the DNRC shall provide explanations for unresolved messages from the CHECK-2 or CHECK-RAS program, as appropriate. In addition, the DNRC shall address all concerns or questions regarding the hydraulic analyses that are raised by FEMA/NSP during the independent QA/QC review.

The DNRC shall document automated data processing and modeling algorithms for GIS-based modeling and provide them to FEMA for review to ensure they are consistent with the standards outlined above. Digital datasets are to be documented and provided to FEMA for approval before performing the hydraulic analyses to ensure the datasets meet minimum requirements. If non-commercial (i.e., custom-developed) software is used for the analyses, then the DNRC shall provide full user documentation, technical algorithm documentation, and software to FEMA for review before performing the hydraulic analyses.

Refer to Appendix B, CTP Contractor Scope of Work, for details concerning this Activity.

Prior to uploading any data to the MIP or delivering any data to FEMA/NSP in digital format, the CTP shall have completed a review checklist as available from the NSP, or similar documentation for that data, for this activity.

Standards: All Hydraulic Analyses work shall be performed in accordance with the standards specified in Section 5 of this MAS.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners* the DNRC shall upload the digital data to the MIP or submit to FEMA by using other digital media if the MIP is unavailable, so that FEMA/NSP can access it for an independent QA/QC review in accordance with the schedule outlined in Section 6 for this Activity. A Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. The MIP shall be updated for status reporting not less than prescribed quarterly periods and when the activity is complete. Where paper documentation is required by State Law for Professional certifications, you may submit the paper in addition to a scanned version of the paper for the digital record.

- Digital profiles of the 10-, 2-, 1- and 0.2-percent-annual-chance water-surface elevations representing existing conditions using the FEMA RASPLOT program or similar software;
- Digital Floodway Data Tables for each flooding source that is compatible with the DFIRM database;
- Digital hydraulic modeling (input and output) files;
- Digital tables with range of Manning's "n" values;
- Explanations for unresolved messages from the CHECK-2 or CHECK-RAS program, as appropriate;

- Digital versions of all backup data used in the analyses;
- Digital versions of draft text for inclusion in the FIS report;
- For GIS-based modeling, deliverables include all input and output data, intermediate data processing products, GIS data layers, and final products in the format of the DFIRM database structure;
- Format Hydraulic Database or Data Delivery consistent with the Data Capture Standards – Appendix N of the Guidelines and Specifications for Flood Mapping Partners; and
- A Summary Report that describes and provides the results of all automated or manual QA/QC review steps taken during the preparation of the DFIRM.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at http://www.fema.gov/fhm/dl_cgs.shtm.

Independent QA/QC Review of Hydraulic Analyses

Responsible Mapping Partner: FEMA/NSP

Scope: FEMA/NSP shall review the technical, scientific, and other information submitted by the DNRC under Hydraulic Analysis to ensure that the data and modeling are consistent with FEMA standards and standard engineering practice and are sufficient to revise the FIRM. FEMA may audit or assist in these activities if deemed to be necessary by the Regional Project Officer. This work shall include, at a minimum, the activities listed below.

- Review the submittal for technical and regulatory adequacy, completeness of required information, and supporting data and documentation. The technical review is to focus on the following:

  - Use of acceptable model(s);
  - Starting water-surface elevations;
  - Cross-section geometry;
  - Manning's "n" values and expansion/contraction coefficients;
  - Bridge and culvert modeling;
  - Flood discharges;
  - Regulatory floodway computation methods; and
  - Tie-in to upstream and downstream non-revised Flood Profiles.

- Use the CHECK-2 or CHECK-RAS program as appropriate to flag potential problems and focus review efforts.
- Maintain records of all contacts, reviews, recommendations, and actions and make them readily available to FEMA.
- Maintain an archive of all data submitted for hydraulic modeling review. (All supporting data must be retained for 3 years from the date funding recipient submits its final expenditure report to FEMA.)
- If data changed during review, then updated deliverables for previous task will be submitted a this time.

This review will be performed in a timely manner so as to eliminate impact to the project schedule.

Standards: All Independent QA/QC work shall be performed in accordance with the standards specified in Section 5 of this MAS.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, FEMA/NSP shall make the following products available to FEMA and the DNRC by uploading the digital data to the MIP or submitting it to the FEMA Regional Office if the MIP is unavailable at the time of delivery and providing a digital copy to the DNRC. A Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. This submittal will occur in accordance with the schedule outlined in Section 6 for this Activity. The MIP shall be updated for status reporting not less than prescribed quarterly periods and when the activity is complete.

- A Summary Report that describes the findings of the independent QA/QC review;
- Recommendations to resolve any problems that are identified during the independent QA/QC review; and
- If the data changed during the Hydrologic and/or Hydraulic Analyses QA/QC process, then the updated and verified deliverables from these activities will be resubmitted at this time.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at http://www.fema.gov/fhm/dl_cgs.shtm.

Floodplain Mapping

Responsible Mapping Partner: DNRC

Scope for Detailed Riverine Analysis: The DNRC shall delineate the 1- and 0.2-percent-annual-chance floodplain boundaries and the regulatory floodway boundaries (if required) for the flooding sources for which detailed hydrologic, and/or hydraulic were performed. The DNRC shall incorporate all new or revised hydrologic, hydraulic and shall use the topographic data acquired under Topographic Data Development to delineate the floodplain and regulatory floodway boundaries on a digital work map.

Scope of Redelineation of Detailed Floodplain Boundaries Using Updated Topographic Data:

(NOTE: This specific task can be tracked in the MIP Workflow separately in the Data Development Task: Perform Redelineation if preferred)

The DNRC shall delineate the 1- and 0.2-percent-annual-chance floodplain boundaries and the regulatory floodway boundaries for the flooding sources as documented in Appendix B. The DNRC shall use the topographic data acquired under Topographic Data Development to delineate the floodplain and regulatory floodway boundaries as appropriate on a digital work map. If the new topographic data does not reflect the same hydraulic characteristics as in effective study, the DNRC shall evaluate the topographic data to determine if changes are significant enough to invalidate the floodplain boundary and regulatory floodway boundary redelineations. If so, the DNRC shall contact the FEMA Regional Project Officer, identified in Section 12 of this MAS, with a recommendation.

Scope for Refinement or Creation of Zone A: The DNRC shall delineate the 1-percent-annual-chance floodplain boundaries for the flooding sources as documented in Appendix B. The DNRC shall use existing topographic data or the topographic data acquired under Topographic Data Development to delineate the floodplain boundaries on a digital work map. The DNRC may expand on the approaches for analyzing Zone A areas outlined in *Guidelines and Specifications for Flood Hazard Mapping Partners* and in FEMA 265, *Managing Floodplain Development in Approximate Zone A Areas* (April 1995), and/or develop new approaches. Such approaches must be coordinated with the FEMA Regional Project Officer identified in Section 12 of this MAS before analysis and mapping begin.

Scope for Non-revised Areas:

(NOTE: This specific task can be tracked in the MIP Workflow separately in the Data Development Task: Perform Redelineation if preferred)

For all flooding sources except those segments for which updated flood data will be developed, the DNRC shall convert the information shown on the effective FIRM and Flood Boundary Floodway Map (FBFM) panels for all appropriate areas of the County to digital format in conformance with FEMA DFIRM specifications. The DNRC shall use the acquired base map for the conversion. The DNRC shall not digitize the flood theme for those segments of flooding sources for which updated flood data will be developed.

Scope for Merging Revised and Non-Revised Information: Upon completion of the floodplain mapping activities for the revised areas and the non-revised areas, the DNRC shall merge the digital floodplain data into a single, updated DFIRM. This work is to include tie-in of flood hazard information for areas that were not studied as part of the Flood Map Project documented in this MAS. The DNRC also shall tie in the revised and non-revised Flood Profiles, floodplain boundaries, and regulatory floodway boundaries with contiguous communities that were not studied as part of the Flood Map Project documented in this MAS. The DNRC shall coordinate with FEMA and any additional Mapping Partners responsible for other components of Floodplain Mapping, as necessary, to resolve any potential tie-in issues.

The DNRC shall incorporate the results of all effective Letters of Map Change (LOMCs).for all affected communities on the DFIRM. Also, the DNRC shall address all concerns or questions regarding Floodplain Mapping that are raised by FEMA/NSP during the independent QA/QC review.

Refer to Appendix B, CTP Contractor Scope of Work, for details concerning this Activity.

Prior to uploading any data to the MIP or delivering any data to FEMA/NSP in digital format, the CTP shall have completed a review checklist as available from the NSP, or similar documentation for that data, for this activity.

STANDARDS: ALL FLOODPLAIN MAPPING WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE STANDARDS SPECIFIED IN SECTION 5 OF THIS MAS. MAPPING QUALITY STANDARDS SHOULD BE CONSISTENT WITH SECTION 7 OF THE MHIP. THE DNRC MAY EXPAND ON THE APPROACHES FOR ANALYZING ZONE A AREAS OUTLINED IN GUIDELINES AND SPECIFICATIONS FOR FLOOD HAZARD MAPPING PARTNERS AND IN FEMA 265, MANAGING FLOODPLAIN DEVELOPMENT IN APPROXIMATE ZONE A AREAS (APRIL 1995), AND/OR DEVELOP NEW APPROACHES. SUCH APPROACHES MUST BE COORDINATED WITH THE FEMA REGIONAL PROJECT OFFICER BEFORE ANALYSIS AND MAPPING BEGIN.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, and upon completion of floodplain mapping for those areas as documented in Appendix B, the DNRC shall upload the digital data to the MIP or submit by using other digital media if the MIP is unavailable at time of delivery, so that FEMA/NSP can access it for the independent QA/QC review. A Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. The mapping for the remaining flooding sources including any non-revised digital panels and all merged revised and non-revised floodplain mapping data is to be submitted for a final QA/QC review at the completion of this activity. This submittal will occur in accordance with the schedule outlined in Section 6 for this Activity. The MIP shall be updated for status reporting not less than prescribed quarterly periods and when the activity is complete. Where paper documentation is required by State Law for Professional certifications, you may submit the paper in addition to a scanned version of the paper for the digital record.

- Digital work maps showing the 1- and 0.2-percent-annual-chance floodplain boundary delineations, regulatory floodway boundary delineations, cross sections, BFEs, flood insurance risk zone labels, and all applicable base map features;
- DFIRM mapping files, prepared in accordance with the requirements in *Guidelines and Specifications for Flood Hazard Mapping Partners*;
- Metadata files describing the DFIRM data, including all required information shown in *Guidelines and Specifications for Flood Hazard Mapping Partners*;
- A Summary Report that describes and provides the results of all automated or manual QA/QC review steps taken during the preparation of the DFIRM as outlined in approved QA/QC Plan;
- Any backup or supplemental information, including supporting calculations and assumptions used in the mapping required for the independent QA/QC review of Hydrologic, Hydraulic Analyses and Floodplain Mapping;
- An explanation for the use of existing topography for the studied reaches, if appropriate.

- Written summary of the analysis methodologies;
- Digital versions of input and output for any computer programs that were used;
- Format Mapping Database or Data Delivery consistent with the Data Capture Standards –Appendix N of the Guidelines and Specifications for Flood Mapping Partners;
- If automated GIS-based models are applied, all input data, output data, intermediate data processing products, and GIS data layers shall be submitted.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at http://www.fema.gov/fhm/dl_cgs.shtm.

Independent QA/QC Review of Floodplain Mapping

Responsible Mapping Partner: FEMA/NSP

Scope: FEMA/NSP shall review the floodplain mapping submitted by the DNRC under Floodplain Mapping to ensure that the results of the analyses performed are accurately represented, the redelineation of

existing data on new, updated topography is appropriate and to ensure that the new DFIRM panels accurately represent the information shown on the effective FIRMs and FBFMs for the unrevised areas that are mapped. FEMA may audit or assist in these activities if deemed to be necessary by the Regional Project Officer. This work shall include, at a minimum, the activities listed below.

- Review the cross sections for proper location and orientation on the work map and agreement with the Floodway Data Table.
- Review the BFEs shown on the work map for proper location and agreement with the results of the hydraulic modeling.
- Review the regulatory floodway widths for agreement with the widths shown in the Floodway Data Table and the results of the hydraulic modeling.
- Review the floodplain boundaries for agreement with the flood elevations shown in the Floodway Data Table and the contour lines and other topographic information shown on the work maps.
- Review the floodplain widths at cross sections as shown on the work maps to ensure they match the Floodway Data Table.
- Review the floodplain boundaries as shown on the work maps to ensure they match the Flood Profiles.
- For non-revised floodplain areas, the 1 and 0.2-percent-annual-chance floodplain boundaries agree with the floodplain boundaries shown on the FIRM and the contour lines, other topographic information, and planimetric information shown on the DFIRM base.
- Road and floodplain relationships are maintained for all unrevised areas.
- Review the flood insurance risk zones as shown on the work maps to ensure they are labeled properly.
- Review the DFIRM mapping files to ensure they were prepared in accordance with the requirements in *Guidelines and Specifications for Flood Hazard Mapping Partners*.
- Review the metadata files to ensure they include all required information shown in *Guidelines and Specifications for Flood Hazard Mapping Partners*.

This review will be performed in a timely manner so as to eliminate impact to the project schedule.

Standards: All Independent QA/QC work shall be performed in accordance with the standards specified in Section 5 of this MAS.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, FEMA/NSP shall make the following products available to FEMA and DNRC by uploading the digital data to MIP or submitting it to the FEMA Regional Office if the MIP is unavailable at the time of delivery and providing a copy in digital format to the DNRC. A Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. This submittal will occur in accordance with the schedule outlined in Section 6 for this Activity. The MIP shall be updated for status reporting not less than prescribed quarterly periods and when the activity is complete.

- A Summary Report that describes the findings of the QA/QC review, noting any deficiencies in or agreeing with the mapping results;
- Recommendations to resolve any problems that are identified during the independent QA/QC review;
- An annotated work map with all questions and/or concerns indicated, if necessary; and
- If data changed during review, then updated deliverables for previous task will be submitted at this time.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at http://www.fema.gov/fhm/dl_cgs.shtm.

Redelineation

(NOTE: It has been inferred that the intention of the Perform Redelineation task in the Work Flow was to provide a single task in which to capture the data for projects that were strictly an upgrade to a digital product, or "digital conversion" along with development of a DFIRM Dbase. However, the definition of Redelineation seems to infer that remapping on updated topographic data is being performed. It is important to understand what each of the Regions intends to use the Redelineation Task for with regarding the project management and tracking in the MIP Workflow so that a consistent definition and definitive guidance can be prepared.)

Responsible Mapping Partner: DNRC

Scope of Redelineation of Detailed Floodplain Boundaries Using Updated Topographic Data:

(NOTE: This specific task can be tracked in the MIP Workflow separately in the Data Development Task: Perform Floodplain Mapping, if preferred)

The DNRC shall delineate the 1- and 0.2-percent-annual-chance floodplain boundaries and the regulatory floodway boundaries for the flooding sources listed in Appendix B. The DNRC shall use the topographic data acquired under Topographic Data Development to delineate the floodplain and regulatory floodway boundaries as appropriate on a digital work map. If the new topographic data does not reflect the same hydraulic characteristics as in effective study, the DNRC shall evaluate the topographic data to determine if changes are significant enough to invalidate the floodplain boundary and regulatory floodway boundary redelineations. If so, the DNRC shall contact the FEMA Regional Project Officer identified in Section 12 of this MAS with a recommendation.

Scope for Non-revised Areas:

(NOTE: This specific task can be tracked in the MIP Workflow separately in the Data Development Task: Perform Floodplain Mapping, if preferred)

For all flooding sources except those segments for which updated flood data will be developed, the DNRC shall convert the information shown on the effective FIRM and Flood Boundary Floodway Map (FBFM) panels for all appropriate areas of the County to digital format in conformance with FEMA DFIRM specifications. The DNRC shall use the acquired base map for the conversion. The DNRC shall not digitize the flood theme for those segments of flooding sources for which updated flood data will be developed.

The DNRC shall incorporate the results of all effective Letters of Map Change (LOMCs) for all affected areas. Also, the DNRC shall address all concerns or questions regarding Redelineation that are raised by FEMA/NSP during the independent QA/QC review.

Refer to Appendix B, CTP Contractor Scope of Work, for details concerning this Activity.

Prior to uploading any data to the MIP or delivering any data to FEMA/NSP in digital format, the CTP shall have completed a review checklist as available from the NSP, or similar documentation for that data, for this activity.

STANDARDS: ALL REDELINEATION WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE STANDARDS SPECIFIED IN SECTION 5 OF THIS MAS. MAPPING QUALITY STANDARDS SHOULD BE CONSISTENT WITH SECTION 7 OF THE MHIP.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners* and upon completion of Redelineation for those flooding sources as documented in Appendix B, the DNRC shall upload the digital data to the MIP or submit by using other digital media if the MIP is unavailable at time of delivery, so that FEMA/NSP can access it for the independent QA/QC review. A Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. The Redelineation for the remaining flooding sources including any non-revised digital panels is to be submitted for a final QA/QC review at the completion of this activity. This submittal will occur in accordance with the schedule outlined in Section 6 for this Activity. The MIP shall be updated for status reporting not less than prescribed quarterly periods and when the activity is complete. Where paper documentation is required by State Law for Professional certifications, you may submit the paper in addition to a scanned version of the paper for the digital record.

- Digital work maps showing the 1- and 0.2-percent-annual-chance floodplain boundary delineations, regulatory floodway boundary delineations, cross sections, BFEs, flood insurance risk zone labels, and all applicable base map features;
- DFIRM mapping files, prepared in accordance with the requirements in *Guidelines and Specifications for Flood Hazard Mapping Partners*;

- Metadata files describing the DFIRM data, including all required information shown in *Guidelines and Specifications for Flood Hazard Mapping Partners*;
- Any backup or supplemental information, including supporting calculations and assumptions used in the mapping required for the independent QA/QC review of Hydrologic, Hydraulic Analyses and Floodplain Mapping;
- An explanation for the use of existing topography for the studied reaches, if appropriate.
- Format Mapping Database or Data Delivery consistent with the Data Capture Standards –Appendix N of the Guidelines and Specifications for Flood Mapping Partners;
- If automated GIS-based models are applied, all input data, output data, intermediate data processing products, and GIS data layers shall be submitted; and
- A Summary Report that describes and provides the results of all automated or manual QA/QC review steps taken during the preparation of the DFIRM as outlined in approved QA/QC Plan.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at http://www.fema.gov/fhm/dl_cgs.shtm.

Independent QA/QC Review of Redelineation

Responsible Mapping Partner: FEMA/NSP

Scope: FEMA/NSP shall review the redelineation submitted by the DNRC under Redelineation to ensure that the redelineation of existing data on new, updated topography is appropriate and to ensure that the new DFIRM panels accurately represent the information shown on the effective FIRMs and FBFMs for the unrevised areas that are mapped. FEMA may audit or assist in these activities if deemed to be necessary by the Regional Project Officer. This work shall include, at a minimum, the activities listed below.

- Review the cross sections for proper location and orientation on the work map and agreement with the Floodway Data Table.
- Review the BFEs shown on the work map for proper location and agreement with the results of the hydraulic modeling.
- Review the regulatory floodway widths for agreement with the widths shown in the Floodway Data Table and the results of the hydraulic modeling.
- Review the floodplain boundaries for agreement with the flood elevations shown in the Floodway Data Table and the contour lines and other topographic information shown on the work maps.
- Review the floodplain widths at cross sections as shown on the work maps to ensure they match the Floodway Data Table.
- Review the floodplain boundaries as shown on the work maps to ensure they match the Flood Profiles.
- For non-revised floodplain areas, the 1 and 0.2-percent-annual-chance floodplain boundaries agree with the floodplain boundaries shown on the FIRM and the contour lines, other topographic information, and planimetric information shown on the DFIRM base.
- Road and floodplain relationships are maintained for all unrevised areas.

- Review the flood insurance risk zones as shown on the work maps to ensure they are labeled properly.
- Review the DFIRM mapping files to ensure they were prepared in accordance with the requirements in *Guidelines and Specifications for Flood Hazard Mapping Partners*.
- Review the metadata files to ensure they include all required information shown in *Guidelines and Specifications for Flood Hazard Mapping Partners*.

This review will be performed in a timely manner so as to eliminate impact to the project schedule.

Standards: All Independent QA/QC work shall be performed in accordance with the standards specified in Section 5 of this MAS.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, FEMA/NSP shall make the following products available to FEMA and the DNRC by uploading the digital data to MIP or submitting it to the FEMA Regional Office if the MIP is unavailable at the time of delivery and providing a digital copy to the DNRC. A Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. This submittal will occur in accordance with the schedule outlined in Section 6 for this Activity. The MIP shall be updated for status reporting not less than prescribed quarterly periods and when the activity is complete.

- A Summary Report that describes the findings of the QA/QC review, noting any deficiencies in or agreeing with the mapping results;
- Recommendations to resolve any problems that are identified during the independent QA/QC review;
- An annotated work map with all questions and/or concerns indicated, if necessary; and
- If data changed during review, then updated deliverables for previous task will be submitted at this time.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at http://www.fema.gov/fhm/dl_cgs.shtm.

DFIRM Database

Responsible Mapping Partner: DNRC

Scope: The DNRC shall apply the final FEMA DFIRM graphic and database specifications to the DFIRM files produced under Floodplain Mapping and/or Redelineation. This work shall include adding all required annotation, line pattern, area shading, and map collar information (e.g., map borders, title blocks, legends, notes to user). The DNRC will be preparing the database for this project in the Standard format. The database shall be produced in accordance with Appendix L of the Guides and Specifications for Flood Hazard Mapping Partners. The DNRC shall coordinate with those Mapping Partners responsible for Floodplain Mapping and/or Redelineation, as necessary, to resolve any problems that are identified during development of the DFIRM Database and graphics.

Refer to Appendix B, CTP Contractor Scope of Work, for details concerning this Activity.

Prior to uploading any data to the MIP or delivering any data to FEMA/NSP in digital format, the CTP shall have completed a review checklist as available from the NSP, or similar documentation for that data, for this activity.

Standards: All DFIRM Database work shall be performed in accordance with the standards specified in Section 5 of this MAS.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, the DNRC shall make the following products available to FEMA by uploading the digital data to the MIP or submitting it to the FEMA Regional Office if the MIP is unavailable at the time of delivery. A Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. This submittal will occur in accordance with the schedule outlined in Section 6 for this Activity. The MIP shall be updated for status reporting not less than prescribed quarterly periods and when the activity is complete. Where paper documentation is required by State Law for Professional certifications, you may submit the paper in addition to a scanned version of the paper for the digital record.

- DFIRM mapping files, prepared in accordance with the requirements in *Guidelines and Specifications for Flood Hazard Mapping Partners*;
- Metadata files describing the DFIRM data, including all required information shown in *Guidelines and Specifications for Flood Hazard Mapping Partners*;
- Complete set of plots of DFIRM panels showing all detailed flood hazard information at a suitable scale;
- A Summary Report that describes and provides the results of all automated or manual QA/QC review steps taken during the preparation of the DFIRM as outlined in approved QA/QC Plan; and
- Format DFIRM Database or Data Delivery consistent with the Data Capture Standards –Appendix N of the Guidelines and Specifications for Flood Mapping Partners.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at http://www.fema.gov/fhm/dl_cgs.shtm.

Independent QA/QC Review of DFIRM Dbase

Responsible Mapping Partner: FEMA/NSP

Scope: Upon completion of the floodplain mapping and redelineation activities, FEMA/NSP shall review the DFIRM spatial database to determine if it meets current FEMA database specifications. In addition, FEMA/NSP shall review the DFIRM to ensure it meets current FEMA graphic specifications. The DNRC shall coordinate with other Mapping Partners, as necessary, to resolve any problems identified during this QA/QC review. This work shall ensure that the requirements below are met.

- All required DFIRM features are accurately and legibly labeled and follow the examples shown in the FEMA DFIRM specifications. This includes all flood insurance risk zones, BFEs, cross sections, studied streams, mapped political entities, and all roads within and adjacent to the 1-percent-annual-chance floodplains.
- All DFIRM features are correctly symbolized with the appropriate symbol, line pattern, or area shading and follow the requirements in *Guidelines and Specifications for Flood Hazard Mapping Partners*.
- All map collar information is complete, correct, and follows the requirements specified in *Guidelines and Specifications for Flood Hazard Mapping Partners*.
- DFIRM mapping files are in one of the GIS file and database formats specified in FEMA's *Guidelines and Specifications for Flood Hazard Mapping Partners* and conform to those specifications for content and attribution.
- DFIRM database files are in one of the database formats specified in FEMA's *Guidelines and Specifications for Flood Hazard Mapping Partners* and conform to those specifications for content and attribution.
- Metadata files describing the DFIRM data include all required information shown in *Guidelines and Specifications for Flood Hazard Mapping Partners*.

This review will be performed in a timely manner so as to eliminate impact to the project schedule.

Standards: All DFIRM Database Development work shall be performed in accordance with the standards specified in Section 5 of this MAS.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, FEMS/NSP shall make the following products available to FEMA and the DNRC by uploading the digital data to the MIP or submitting it to the FEMA Regional Office if the MIP is unavailable at the time of delivery and providing a digital copy to the DNRC. A Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. The MIP shall be updated for status reporting not less than prescribed quarterly periods and when the activity is complete. This submittal will occur in accordance with the schedule outlined in Section 6 for this Activity.

- A Summary Report that describes the findings of the QA/QC review noting any deficiencies in or agreeing with the mapping results and the results of all automated or manual QA/QC steps taken during the independent QA/QC review;
- Recommendations to resolve any problems that are identified during the independent QA/QC review; and
- An annotated copy of the DFIRM with all questions and/or concerns indicated, if necessary.
- If the data changed during the QA/QC process, then the updated deliverables from Floodplain Mapping and Redelineation will be resubmitted at this time.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at http://www.fema.gov/fhm/dl_cgs.shtm.

Produce Preliminary Map Products

Responsible Mapping Partners: DNRC

Scope: Preliminary Map Products consists of the final preparation, review, and distribution of the Preliminary copies of the DFIRM and FIS report for community official and general public review and comment. FEMA may audit or assist in these activities if deemed to be necessary by the Regional Project Officer. The activities to be performed are summarized below.

Preliminary Transmittal Letter Preparation. The DNRC shall prepare letters and transmit the Preliminary copies of the DFIRM and FIS report and related enclosures to all affected communities, all other Project Team members, the State NFIP Coordinator, the FEMA Regional Office, and others as directed by FEMA. This letter may be prepared for FEMA only or FEMA and DNRC signature.

Distribution of Preliminary DFIRM and FIS Report: The DNRC shall distribute the Preliminary copies of the DFIRM and FIS report to all affected communities, all other Project Team members, the State NFIP Coordinator, the FEMA Regional Office, and others as directed by FEMA.

News Release Preparation: The DNRC shall prepare news release notifications of BFE changes for all affected communities if appropriate and perform QA/QC reviews of the notices for accuracy and compliance with FEMA format requirements. The DNRC shall file the notifications for later submittal to FEMA for review.

Preliminary Summary of Map Actions (SOMA) Preparation: The DNRC shall prepare Preliminary SOMAs for all affected communities if appropriate. The SOMA shall list pertinent information regarding LOMCs that will be affected by the issuance of the DFIRM (i.e., superseded, incorporated, revalidated).

Refer to Appendix B, CTP Contractor Scope of Work, for details concerning this Activity.

Standards: All Preliminary Map Products work shall be performed in accordance with the standards specified in Section 5 of this MAS. Mapping quality standards should be consistent with Section 7 of the MHIP. The Data Capture Standards must be met for this deliverable to be acceptable.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, DNRC shall make the following products available to FEMA *and the DNRC* by uploading the digital data to the MIP or submitting it to the FEMA Regional Office if the MIP is unavailable at the time of delivery. A Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. The MIP shall be updated for status reporting not less than prescribed quarterly periods and when the activity is complete. The DNRC shall upload the required deliverables to the MIP in accordance with the schedule outlined in Section 6 for this Activity.

The MIP shall be updated for status reporting not less than prescribed quarterly periods and when the activity is complete.

- Preliminary transmittal letters shall be prepared and transmitted. These letters and any additional letters requested by FEMA shall be prepared in accordance with the current version of the FEMA *Document Control Procedures Manual* and in conjunction with Guidance provided by the Region and/or their contractor.
- The FIS report is prepared in the FEMA *Countywide or Partial Countywide* Format as documented in Appendix J of *Guidelines and Specifications for Flood Hazard Mapping Partners.*
- Preliminary copies of the DFIRM and FIS report, including all updated data tables and Flood Profiles shall be mailed to the Chief Executive Officer (CEO) and floodplain administrator of each affected community, all other Project Team members, the State NFIP Coordinator, the FEMA Regional Office, and others as directed by FEMA.
- Preliminary SOMAs, prepared in accordance with FEMA requirements, shall be provided as appropriate.
- If appropriate, revised DFIRM mapping files, prepared in accordance with the requirements in *Guidelines and Specifications for Flood Hazard Mapping Partners*, shall be provided by uploading the digital data to the MIP or submitting it by using other digital media if the MIP is unavailable at the time of delivery.
- If appropriate, revised DFIRM database files, prepared in accordance with the requirements in *Guidelines and Specifications for Flood Hazard Mapping Partners*, shall be provided by uploading the digital data to the MIP or submitting it by using other digital media if the MIP is unavailable at the time of delivery.
- If appropriate, revised metadata files describing the DFIRM data, including all required information shown in *Guidelines and Specifications for Flood Hazard Mapping Partners*, shall be provided by uploading the digital data to the MIP or submitting it by using other digital media if the MIP is unavailable at the time of delivery.
- A Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance.
- A Summary Report that describes and provides the results of all automated or manual QA/QC review steps taken during the final preparation of the preliminary DFIRM shall be provided as outlined in approved QA/QC Plan.

Independent QA/QC of Preliminary Map Products

Responsible Mapping Partners: FEMA/NSP

Scope includes:

Final QA/QC Review of Preliminary DFIRM and FIS Report: The FEMA/NSP shall perform a final QA/QC review of the Preliminary DFIRM and FIS report, including all data tables, Flood Profiles, and other components of the FIS report. The QA/QC review procedures shall be consistent with the *Guidelines and Specifications for Flood Hazard Mapping Partners* and the QA/QC report submitted for approval at the end of scoping.

Discrepancy Resolution: The DNRC shall work to resolve discrepancies identified during the final QA/QC review.

Deliverables: In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners*, FEMA/NSP shall make the following products available to FEMA and the DNRC by uploading the digital data to the MIP or submitting it to the FEMA Regional Office if the MIP is unavailable at the time of delivery and providing a digital copy to the DNRC. A Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. The MIP shall be updated for status reporting not less than prescribed quarterly periods and when the activity is complete. This submittal will occur in accordance with the schedule outlined in Section 6 for this Activity.

- A Summary Report that describes the findings of the QA/QC review noting any deficiencies in or agreeing with the mapping results and the results of all automated or manual QA/QC steps taken during the independent QA/QC review;
- Recommendations to resolve any problems that are identified during the independent QA/QC review; and
- An annotated copy of the DFIRM with all questions and/or concerns indicated, if necessary.
- If data changed during review, then updated deliverables for previous task will be submitted at this time.

Appendix M and Appendix N may be downloaded from the FEMA Flood Hazard Mapping website at http://www.fema.gov/fhm/dl_cgs.shtm.

Post-Preliminary Processing

Responsible Mapping Partners: DNRC and FEMA/NSP

Scope: Post-preliminary Processing includes coordination with FEMA and the Community to schedule a Community Meeting(s) for review of the Preliminary DFIRM if required. This activity consists of finalizing the DFIRM and FIS report after the Preliminary copies of the DFIRM and FIS report have been issued to community officials and the public for review and comment. FEMA may audit or assist in these activities if deemed to be necessary by the Regional Project Officer. The activities to be performed are summarized below.

Community Coordination Meeting: If a community coordination meeting is required, DNRC shall arrange for and verify that the following activities are completed:

- Establish invitee list
- Schedule meeting data and place
- Complete and Distribute Meeting Notice/Letter
- Record Meeting Minutes, and
- Identify any/all communities with BFE changes for required appeal period.

Initiation of Statutory 90-Day Appeal Period: When required, upon completion of a 30-day community comment period and/or final coordination meeting with the affected communities, the DNRC shall arrange for and verify that the following activities are completed in accordance with the current version of the FEMA *Guidelines and Specifications for Flood Hazard Mapping Partners* and *Document Control Procedures Manual*:

- Proposed BFE determination letters are sent to the community CEOs and floodplain administrators.

  News release notifications of BFE changes are published in prominent newspapers with local circulation in accordance with 44 CFR.

- The DNRC shall prepare the appropriate notices (Proposed Rules) that are to be published in the *Federal Register*. The DNRC shall then deliver those notices to FEMA for publication.
- When the DNRC holds public meetings to present and discuss the results of this Flood Map Project, FEMA may attend the meetings and assist where possible if requested.

Resolution of Appeals and Protests: FEMA/NSP, supported by the DNRC, shall review and resolve appeals and protests received during the 90-day appeal period. For each appeal and protest, the following activities shall be conducted as appropriate:

- Initial processing and acknowledgment of submittal;
- Technical review of submittal;
- Preparation of letter(s) requesting additional supporting data;
- Performance of revised analyses; and
- Preparation of a draft resolution letter for co-signature with FEMA and the DNRC and revised DFIRM and FIS report materials for FEMA review.

The DNRC shall mail all associated correspondence upon authorization by FEMA.

Preparation of Special Correspondence: The DNRC shall support FEMA/NSP in responding to comments not received within the 90-day appeal period, but before the maps become effective (referred to as "special correspondence"), including drafting responses for FEMA review when appropriate and finalizing responses for co-signature. The DNRC shall also shall mail the final correspondence (and enclosures if appropriate) and distribute appropriate copies of the correspondence and enclosures upon receipt of authorization from FEMA.

Revision of FIRM and FIS Report: If necessary, the DNRC shall work together with FEMA/NSP to revise the DFIRM and FIS report and shall distribute Revised Preliminary copies of the DFIRM and FIS report to the CEO and floodplain administrator of each affected community, all other Project Team members, the State NFIP Coordinator, the FEMA Regional Office, and others as directed by FEMA.

Final SOMA Preparation: The DNRC shall prepare Final SOMAs for the affected communities, with assistance from FEMA as appropriate.

Processing of Letter of Final Determination: The DNRC shall work with FEMA/NSP to establish the effective date for the DFIRM and FIS report, and shall prepare a Letter of Final Determination (LFDs) for each affected community for FEMA review in coordination with the Region and their contractor, and in

accordance with the FEMA *Document Control Procedures Manual*. The DNRC shall mail the final signed LFDs and enclosures and distribute appropriate copies of the signed LFDs upon receipt of authorization from FEMA.

Processing of Final DFIRM and FIS Report for Printing: The DNRC shall prepare final reproduction materials for the DFIRM and FIS report and provide these materials to the FEMA Map Service Center for printing by the U.S. Government Printing Office. They shall also prepare the appropriate paperwork to accompany the DFIRM and FIS report (including Print Processing Worksheet, Printing Requisition Forms, and Community Map Actions Form) and transmittal letters to the community CEOs.

Revalidation Letter Processing. The DNRC, when appropriate, shall prepare and distribute letters for FEMA signature to the community CEOs and floodplain administrators to notify the affected communities about LOMCs for which determinations will remain in effect after the DFIRM and FIS report become effective.

Archiving Data: The FEMA/NSP shall ensure that technical and administrative support data are packaged in the FEMA required format and stored properly in the library archives until they are transmitted to the FEMA Engineering Study Data Package Facility. In addition, the FEMA/NSP will maintain copies of all data for a period of no less than 3 years.

Refer to Appendix B, CTP Contractor Scope of Work, for details concerning this Activity.

Prior to uploading any data to the MIP or delivering any data to FEMA/NSP in digital format, the CTP shall have completed a review checklist as available from the NSP, or similar documentation for that data, for this activity.

Standards: All Post Preliminary DFIRM work shall be performed in accordance with the standards specified in Section 5 of this MAS.

Deliverables: The MIP shall be updated for status reporting not less than prescribed quarterly periods and when the activity is complete. In accordance with the TSDN format described in Appendix M of *Guidelines and Specifications for Flood Hazard Mapping Partners* and the requirements documented in Section 1 and Appendix A of the FEMA *Document Control Procedures Manual*, FEMA's Contractor and/or FEMA/NSP or DNRC shall make the following products available to FEMA by uploading the digital data to the MIP or submitting it to the FEMA Regional Office if the MIP is unavailable at the time of delivery. A Federal Geographic Data Committee (FGDC) adopted metadata profile, Content Standard for Digital Geospatial Metadata (CSDGM), must accompany the uploaded digital data in order to facilitate proper cataloging of the data for search and retrieve capabilities within the MIP. The metadata profile should be obtained from FEMA or its contractor to assure compliance. This submittal will occur in accordance with the schedule outlined in Section 6 - Schedule. These products will be made available to FEMA in accordance with the schedule outlined in Section 6 for this Activity:

- Documentation that the news releases were published in accordance with FEMA requirements;
- Documentation that the appropriate *Federal Register* notices (Proposed and Final Rules) were published in accordance with FEMA requirements;
- Draft and final Special Correspondence (and all associated enclosures, backup data, and other related information) for FEMA review and signature as appropriate;

- Draft and final Appeal and Protest acknowledgment, additional data, and resolution letters (and all associated enclosures, backup data, and other related information) for FEMA review and signature as appropriate;
- Draft and final LFDs (and all associated enclosures, backup data, and other related information) for FEMA review and signature;
- DFIRM negatives and final FIS report materials, including all updated data tables and Flood Profiles;
- Paperwork for the final DFIRM and FIS report materials;
- Transmittal letters for the printed DFIRM and FIS report;
- LOMC Revalidation Letters if appropriate;
- Complete, organized archived technical and administrative support data; and
- Complete, organized and archived case file and flood elevation docket.

SECTION 2—TECHNICAL AND ADMINISTRATIVE SUPPORT DATA SUBMITTAL

The Project Team members for this Flood Map Project that have responsibilities for activities included in this MAS shall comply with the data submittal requirements summarized below.

All supporting documentation for the activities in this Mapping Activity Statement shall be submitted in the TSDN format in accordance with Appendix M of the FEMA *Guidelines and Specifications for Flood Hazard Mapping Partners*, dated April 2003. Appendix M is available for viewing or download on the FEMA Web site at http://www.fema.gov/pdf/fhm/frm_gsam.pdf. Table 2-1 indicates the sections of the TSDN that apply to each mapping activity.

If any issues arise that could affect the completion of an activity within the proposed scope or budget, the responsible Mapping Partner shall complete a Special Problem Report (SPR) as soon as possible after the issue is identified and submitted to FEMA. The SPR is to describe the issue and propose possible resolutions. (For additional information on SPRs, refer to Appendix M, Subsection M.2.1.1 of *Guidelines and Specifications for Flood Hazard Mapping Partners*.)

Table 2-1. Mapping Activities and Applicable TSDN Sections

TSDN Section	Mapping Activities													
	Scoping	Field Survey	Topo Data	QA/QC of Topo	Base Map	Hydrology	QA/QC of Hydrology	Hydraulic Analysis	QA/QC of Hydraulics	Flood-plain Mapping (and Re-delineation)	QA/QC of FP Mapping	DFIRM Database	Preliminary Map Products	Post-Preliminary
General Documentation														
Special Problem Reports	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Telephone Conversation Reports	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Meeting Minutes/ Reports	X	X	X	X	X	X	X	X	X	X	X	X	X	X
General Correspon-dence	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Engineering Analyses														
Hydrologic Analyses		X			X	X	X	X	X	X	X			
Hydraulic Analyses		X			X	X	X	X	X	X	X			
Key to Cross-Section Labeling		X			X	X	X	X	X	X	X			
Key to Transect Labeling		X			X	X	X	X	X	X	X			
Draft FIS Report					X	X	X	X	X					
Mapping Information	X		X	X						X	X	X	X	X
Miscellan-eous Reference Information	X	X	X	X	X	X	X	X	X	X	X	X	X	X

SECTION 3—PERIOD OF PERFORMANCE

The mapping activities outlined in this MAS will begin on September 1, 2006, and will be completed no later than September 30, 2009. The mapping activities may be terminated at the option of FEMA or the DNRC in accordance with the provisions of the Partnership Agreement dated March 18, 2005. If these Mapping Activities are terminated; the remaining funds from uncompleted activities, provided by FEMA for this Mapping Activity Statement, will be returned to FEMA.

SECTION 4—FUNDING/LEVERAGE

FEMA is providing funding, in the amount of X, to the DNRC for the completion of this Flood Map Project. The DNRC shall provide any additional resources required to complete the assigned activities for this Flood Map Project. During the scoping process, additional needs may be identified. Activities associated with any additional needs would be performed based on availability of additional funds. The

CTP Leverage listed below includes in-kind services and blue book values for acquired information (i.e. base map data, hydrologic and hydraulic analyses, etc.).

Funding for Project	FEMA Contribution	CTP Contribution	% Leverage	Total Project Cost
TOTAL FUNDING AMOUNTS	X	X	20%	X

SECTION 5—STANDARDS

The standards relevant to this Mapping Activity Statement are provided in Tables 5-1 and 5-2. Information on the correct volume, appendix, section, or subsection of the FEMA *Guidelines and Specifications for Flood Hazard Mapping Partners* to be referenced for each mapping activity are summarized in Table 5-2. These Guidelines are available for viewing or download from the FEMA Flood Hazard Mapping Web site at http://www.fema.gov/fhm/dl_cgs.shtm.

Table 5-1. Applicable Standards for Project Activities

Applicable Standards	Activities														
	Scoping	Field Survey	Topo Data	QA/QC Topo Data	Base Map	Hydrology	QA/QC Hydrology	Hydraulic Analysis	QA/QC of Hydraulic Analysis	Floodplain Mapping (inc. Redelineation	QA/Qc Flood-plain Mapping	DFIRM Dbase	QA/QC DFIRM Dbase	Preliminary Map Products	Post-Preliminary Processing
Guidelines and Specifications for Flood Hazard Mapping Partners, April 2003	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
American Congress on Surveying and Mapping Procedures	X	X	X	X											
Global Positioning System (GPS) Surveys: National Geodetic Survey (NGS-510), "Guidelines for Establishing GPS-Derived Ellipsoid Heights," November 1997	X	X	X	X											
Engineer Manual 1110-1-1000, *Photogrammetric Mapping* (USACE), July 1, 2002	X	X	X	X											
Engineer Manual 1110-2-1003, *Hydrographic Surveys* (USACE), January 1, 2002	X	X													
"Numerical Models Accepted by FEMA for NFIP Usage," Updated April 2003	X				X	X	X	X	X						
Content Standard for Digital Geospatial Metadata (Federal Geographic Data Committee), 1998	X		X	X						X	X	X	X	X	X
Document Control Procedures Manual, December 2000	X													X	X
44 Code of Federal Regulations Part 66 and 67	X													X	

Table 5-2. Project Activities and Applicable Portions of FEMA Guidelines and Specifications

Activity Description	Applicable Volume, Section/Subsection, and Appendix
Scoping	Appendix I, Scoping Report document attached in Appendix A to this Mapping Activity Statement; 44 Code of Federal Regulations Part 66 and 67
Field Survey	Volume 1, Section 1.4 (specifically Subsection 1.4.2.1) Appendix A, Sections A.4, A.5, A.6, A.7, and A.8 Appendix F, Section F.3 Appendices B, C, and M
Topographic Data Development	Volume 1, Section 1.4 (specifically Subsection 1.4.2.1) Appendix A, Sections A.2 , A.3, A.7, and A.8 Appendix M
Independent QA/QC Review of Topographic Data	Volume 1, Section 1.4 (specifically Subsections 1.4.1 and 1.4.2.1) Appendix A, Sections A.2, A.3, A.7 (specifically Subsection A.7.5), and A.8 (specifically Subsection A.8.6) Appendix M
Base Map Acquisition and Preparation	Volume 1, Section 1.3 (specifically Subsection 1.3.1.8) and 1.4 (specifically Subsections 1.4.3.1 and 1.4.3.2) Appendix A, Section A.1 (specifically Subsection A.1.1)
Hydrologic Analyses	Volume 1, Section 1.4 (specifically Subsections 1.4.2.2 and 1.4.2.4) Appendix A, Section A.4 Appendix C, Sections C.1 and C.7 Appendices E, F, G, H, and M

Activity Description	Applicable Volume, Section/Subsection, and Appendix
Independent QA/QC Review of Hydrologic Analyses	Volume 1, Section 1.4 (specifically Subsection 1.4.1) Appendix A, Section A.4 Appendix C, Section C.2 Appendices E, F, G, H, and M
Hydraulic Analyses	Volume 1, Section 1.4 (specifically Subsections 1.4.2.2 and 1.4.2.4) Appendix A, Section A.4 (specifically Subsection A.4.7) Appendix C, Sections C.3 and C.7
Independent QA/QC Review of Hydraulic Analyses	Volume 1, Section 1.4 (specifically Subsection 1.4.1) Appendix A, Section A.4 (specifically Subsection A.4.7) Appendix C, Section C.5
Floodplain Mapping	Volume 1, Section 1.4 (specifically Subsections 1.4.2.2, 1.4.2.3, and 1.4.3.2) Appendix C, Sections C. 4 and C.6 (specifically Subsection C.6.1.3) Appendix D, Sections D.2 (specifically Subsection D.2.7) and D.3 (specifically Subsection D.3.7) Appendices E, F, G, H, K, L, and M
Perform Redelineation	Volume 1, Section 1.4 (specifically Subsections 1.4.2.2, 1.4.2.3, and 1.4.3.2) Appendix C, Section C.6 (specifically Subsection C.6.1.3) Appendices K. L, and M
Independent QA/QC Floodplain Mapping (including Redelineation/Digitization)	Volume 1, Section 1.4 (specifically Subsections 1.4.1 and 1.4.2.3) Appendix C, Sections C.4 and C.6 Appendix D, Sections D.2 (specifically Subsection D.2.7) and D.3 (specifically Subsection D.3.7) Appendices E, F, G, H, K, L, and M

Activity Description	Applicable Volume, Section/Subsection, and Appendix
Independent QA/QC Review of DFIRM Database and Graphic Specs	Volume 1, Section 1.4 (specifically Subsections 1.4.2.3, 1.4.3.3, 1.4.3.9, and 1.4.3.10) Appendices K, L, and M
Production of Preliminary Map Products	Volume 1, Sections 1.4 (specifically Subsections 1.4.2 and 1.4.3) and 1.5 (specifically Subsection 1.5.1) Appendices J, K, L, and M
Post-Preliminary Processing	Volume 1, Section 1.5 (specifically Subsection 1.5.2) Appendices J, K, L, and M

SECTION 6—SCHEDULE

The activities documented in this MAS shall be completed in accordance with the project schedule below. If changes to this schedule are required, the responsible Mapping Partner shall coordinate with FEMA and the other Mapping Partners in a timely manner.

Table 6-1. Project Schedule

Activities	RESPONSIBLE PARTNER(S)	DATE DUE
Scoping (including 1/3 Outreach)	DNRC, FEMA/NSP	6/30/06
Field Surveys	DNRC	10/30/06
Topographic Data Development	DNRC	11/30/06
Independent QA/QC Review of Topographic Data	FEMA/NSP	12/30/06
Base Map Acquisition	DNRC	10/30/06
Hydrologic Analyses	DNRC	1/30/07
Independent QA/QC Review of Hydrologic Analyses	FEMA/NSP	2/30/07
Hydraulic Analyses	DNRC	3/30/07
Independent QA/QC Review of Hydraulic Analyses	FEMA/NSP	4/30/07
Floodplain Mapping: • Detailed Riverine • Refinement or Creation of Zone A • Merging Revised and Unrevised Areas <Floodplain Mapping or Redelineation> • Redelineation Using Effective Flood Profiles and Updated Topographic Data • Redelineation/Digitization of Non-Revised Areas	DNRC	5/30/07
Independent QA/QC Review of Floodplain Mapping	FEMA/NSP	6/30/07
Redelineation <Floodplain Mapping or Redelineation> • Redelineation Using Effective Flood Profiles and Updated Topographic Data • Redelineation/Digitization of Non-Revised Areas	DNRC	n/a
Independent QA/QC Review of Redelineation	FEMA/NSP	n/a
DFIRM Database (including Graphic Specifications)	DNRC	7/30/07
Independent QA/QC Review of DFIRM Database	FEMA/NSP	8/30/07
Produce Preliminary Map Products (including 1/3 Outreach)	DNRC	9/30/07
Post-Preliminary Processing (including 1/3 Outreach)	DNRC, FEMA/NSP	9/30/08

SECTION 7—CERTIFICATIONS

Field Surveys and Topographic Data Development

A Registered Professional Engineer or Licensed Land Surveyor shall certify topographic data, in accordance with 44 CFR 65.5(c). Certification of topographic data by the American Society for Photogrammetry and Remote Sensing is also acceptable.

Base Map Acquisition and Preparation

- A community official or responsible party shall provide written certification that the digital data meet FEMA minimum standards and specifications.
- The responsible Mapping Partner shall provide documentation that the digital base map can be used by FEMA. Please note that uploading base map data to the MIP does not constitute agreement that the digital base map can be used by FEMA. Documentation that the digital base map can be used by FEMA will still be required.

Certifications must be made at the time the intermediate data is submitted. For example, if hydrologic data is submitted, certification will be required at the time it is submitted.

Hydrologic Analyses, Hydraulic Analyses, and Floodplain Mapping

- A Registered Professional Engineer shall certify hydrologic and hydraulic analyses and data in accordance with 44 CFR 65.6(f).
- A Registered Professional Engineer or Licensed Land Surveyor shall certify topographic information in accordance with 44 CFR 65.5(c).
- Any levee systems to be accredited will be certified in accordance with 44 CFR 65.10(e).

Floodplain Mapping, Independent QA/QC Review of Floodplain Mapping and DFIRM Database

The DFIRM metadata files shall include a description of the horizontal and vertical accuracy of the DFIRM base map and floodplain information.

SECTION 8—TECHNICAL ASSISTANCE AND RESOURCES

Project Team members may obtain copies of FEMA-issued LOMCs, archived engineering backup data, and data collected as part of the Mapping Needs Assessment Process from FEMA and/or your Regional Project Officer.

General technical and programmatic information, such as FEMA 265 and the Quick-2 computer program, can be downloaded from the FEMA Web site (http://www.fema.gov./fhm/). Specific technical and programmatic support may be provided through the FEMA and/or their contractor; such assistance should be requested through the FEMA Project Officer specified in Section 12 of this MAS.
Project Team members also may consult with the FEMA Regional Project Officer to request support in the areas of selection of data sources, digital data accuracy standards, assessment of vertical data accuracy, data collection methods or subcontractors, and GIS-based engineering and modeling training.

SECTION 9—CONTRACTORS

The DNRC intends to use the services of PBS&J as a contractor for this Flood Map Project. The DNRC shall ensure that the procurement for all contractors used for this Flood Map Project complies with the requirements of 44 CFR 13.36.

SECTION 10—REPORTING

FINANCIAL REPORTING:
Because funding has been provided to the DNRC by FEMA, financial reporting requirements for the DNRC will be in accordance with Cooperative Agreement Articles V and VI.
STATUS REPORTING:

Status reports will be submitted on a quarterly basis in accordance with the financial reporting submittals. At a minimum these reports will include a summary of the work as outlined in the Cooperative Technical Partner (CTP)/Map Modernization Project Quarterly Report located in Appendix B of this Mapping Activity Statement. The Project Officer, as needed, may request additional information on status.

The DNRC may meet with FEMA and/or their contractor more frequently (up to bi-weekly if needed) to review the progress of the project in addition to the quarterly financial and status submittals. These meetings will alternate between FEMA's Regional Office, the DNRC office and conference calls as necessary.

Section 11—Project Coordination

Throughout the project, all members of the Project Team will coordinate, as necessary, to ensure the products meet the technical and format specifications required and contain accurate, up-to-date information. Coordination activities shall include:

- Meetings, teleconferences, and video conferences with FEMA and other Project Team members as needed;
- Telephone conversations with FEMA and other Project Team members on a scheduled basis and an ad hoc basis, as needed;
- Updates to the MIP, and other FEMA status information systems as discussed in this document; and
- E-mail, facsimile transmissions, and letters, as required.

SECTION 12—POINTS OF CONTACT

The points of contact for this Flood Map Project are Marijo Camrud, the FEMA Regional Project Officer; Terry Voeller, the Project Manager for the DNRC; or subsequent personnel of comparable experience who are appointed to fulfill these responsibilities. When necessary, the any additional assistance of FEMA should be requested through the FEMA Regional Project Officer.

Each party has caused this MAS to be executed by its duly authorized representative.

Jack Stults — Date

Administrator, Water Resources Division
Montana Department of Natural Resources and Conservation

Millie Bowman — Date

Montana Map Mod Coordinator
Project Manager
Montana Department of Natural Resources and Conservation

Robert Ives — Date

HIRA Branch Chief
Federal Emergency Management Agency, Region VIII

Marijo Camrud — Date

Regional Project Officer
Federal Emergency Management Agency, Region VIII

Dave Jula — Date

Michael Baker Jr., Inc.
National Service Provider